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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION, OFFICE OF SECRETARY,
NEW ALBANY, IND., February 5th, 1897.

All members of the Western Gas Association who contemplate contributions to the "Wrinkle Department" should forward them, before March 20th, to its Editor, Mr. George Treadway Thompson, No. 40 Wall street, New York city.

It is hoped that many will avail themselves of the opportunity to assist in keeping this most interesting and instructing department up to its usual standard.

Members will please act promptly and forward "Wrinkles" without further solicitation. JAMES W. DUNBAR, Secretary.

BRIEFLY TOLD.

OBITUARY NOTE, MR. JAMES AUSTIN.—We regret the necessity that compels us to report the death of Mr. James Austin, for many years President of the Consumers Gas Company, of Toronto, Canada, and who had served on its Board of Directors from the formation of the Company, in 1848. Mr. Austin's summons came on the evening of February 27th, and his death was the sad sequel to an illness which covered a long and wearisome period. Deceased was born in Armagh, Ireland, in 1813, and received his education in the common school of that city, which tutelage was sufficient to enable him later on, in the intervals between work and rest, to fully appreciate that every hour of such intervals could be profitably employed in perfecting the rudiments earlier obtained. He had attained his 16th year when his parents determined to emigrate to America, they finally settling in Canada, in 1830. He elected to become a printer, and, after an apprenticeship of four years, in which he thoroughly mastered that art, he pursued his calling in various parts of Canada and the States. Careful in his methods and frugal in his habits, in 1844 he had saved sufficient money to enter into partnership with Mr. Patrick Foy, under the firm name of Foy & Austin, they engaging in the wholesale grocery business, with headquarters at King and Jarvis streets, Toronto, Canada. The concern prospered from the start, and on its dissolution (1870) Mr. Austin was known in the commercial life of Toronto and of the Province as a man of affairs and of means. Naturally, during the period between 1844–1870, Mr. Austin's interests were not alone identified with the grocery trade, and as the city of Toronto grew and prospered, such development carrying with it the inception and growth of many corporations inseparable from the growth of a populous center, he was concerned in all that concerned it. In 1848 the charter of the present Consumers Gas Company was obtained, and Mr. Austin was of the body who organized it. In this connection it is worthy of note that two of his associates at that time in the Company are still in its Board of Directors—Messrs. Samuel Alcorn and Isaac Gilmour. In due time he became Vice-President of the Company, and in the later 70's was chosen its President, succeeding the late Mr. E. H. Rutherfurd. To its affairs he gave much of his time and counsel, and that his management was wise only requires the statement that to-day it is one of the most prosperous gas

companies in America. In 1871 he founded the Dominion Bank, and was its President up to the time of his death. In 1871 he assisted in organizing the Queen City Fire Insurance Company and the Hand-in-Hand Insurance Company, both of which concerns lose a President by his decease. Another corporation that benefited through his counsel was the North of Scotland Canadian Mortgage Company, he having served it for years as Chairman of its Canadian Board. He was married in 1844 to Miss Susan Bright, of East Toronto, who survives him, as do a son and two daughters. He was a prominent member of the Central Methodist Church, and had the esteem of his fellow-citizens, before whom he had great prominence for over half a century. Interment was made in St. James Cemetery, March 2d.

MELTING OUT LEAD JOINTS IN PUBLIC STREETS NO CRIME.—A case that, although in a sense is a personal one, in that it affects a man well and favorably known in the gas business of the country, is nevertheless sufficiently impersonal to warrant this prominent mention, since the application of the story can easily be made at home by any gas manager who has had or who will have occasion to separate gas pipes that (having been once laid in the streets, are to be relaid in other localities), require freeing from the lead joints that bound them. The scheme of plant reconstruction which has been going on in Hartford, Conn., for some time back, in respect to the Hartford City Gas Light Company's works and mains, included the replacing of several miles of pipes of comparatively small diameters (4 and 6 inch) by pipes of larger capacities. In Hartford the practice has been to use lead joints. The small pipes that were taken up in many instances were of sufficient caliber, and were sufficiently sound as to the metal in them, to warrant their being placed in other districts where no gas supply had been laid on. In the course of the whole operation it became necessary to separate many lengths of the pipes to be relaid from their jointings, and to effect this the common practice of piling the pipes in an available open public place, and subjecting them to the action of a bonfire, was resorted to. This plan had been acted on in Hartford for years, without complaint, up to some months ago, when the authorities, on the occasion of a "pipe burning out," arrested three workmen of the Company in charge of the last holocaust. They were arraigned in the Police Court and charged with committing acts against public safety and convenience. Before the culprits uttered their plea in answer, Gen. John P. Harbison, Treasurer of the Company, asked to be allowed to plead to the complaint, urging that, as he issued the orders under which the workmen had acted, he, not they, was responsible to the law. The presiding justice (Mr. Bill) assented to the substitution; and so the Treasurer was tried. The defendant admitted the kindling of the fire and the application of its flames, detailing why the same were "fanned." The result was a conviction, and Gen. Harbison was ordered to pay the sum of $40 and costs. An appeal to the Superior Court was promptly taken, and some days ago the ultimate result was reached, the State's Attorney advising that the case be discontinued, as the evidence showed that neither the defendant, personally, nor the Company, collectively, had violated any law. This determination goes to show, and in fact implies, that any gas company has the right to use those means best calculated to put it in position to best and quickest arrange its service of light for and to the community in which it operates. There must be reason in all things; and while it might be unreasonable that the Hartford Company should seek to burn out its pipes in the busiest part of Main street, it is nevertheless quite reasonable that it should exercise that right or privilege in any of the far less unfrequented highways. And as it is in Hartford in that respect, so should it be in every other center that supports a gas company. General Harbison should be congratulated on the stand that he took.

NOTES.—We understand that the Common Council of Gloversville, N. Y., has granted the right to S. H. Kennedy and others to lay gas mains in that place for the supply of either natural or manufactured gas. Those in the gas business may perhaps be forgiven for believing that the present Company is quite up to supplying both Gloversville and Johnstown with all the gas that either place could possibly use. ——At the annual meeting of the New Jersey Gas Improvement Company, held at Mount Holly, N. J., about a fortnight ago, the capital stock was, and very sensibly, too, reduced from $100,000 to $10,000. ——The Whitneyite party now in control of the properties of the Halifax (Nova Scotia) Gas Light Company have agreed to reduce the gas rate in that city to $1.50 per 1,000 cubic feet, the concession to go into effect November 1st.——The proprietors of the Capital Gas Company, of Sacramento, Cal., have refused to pay the city license fee of $150 quarterly, on the ground that its franchise exempts it from such taxation.——In our mention last week of the changes in the Eastern representation of the P. H. & F. M. Roots Company, we should have said that the New York office (it is not an agency) remains, as before, in charge of Mr. J. B. Stewart.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—Continued from page 369.]

PROCEEDINGS, TWENTY-SEVENTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD IN YOUNG'S HOTEL, BOSTON, MASS., FEB. 17 AND 18, 1897.

SECOND DAY, FEB. 18.—MORNING SESSION.

The Association was called to order for the second day's sessions at 10 A.M., Thursday, Feb. 18th, by the President, who announced that the first thing in order was the paper by Col. Frank S. Richardson, of North Adams, Mass., on

SEPARATE METERS AND SPECIAL PRICES FOR GAS STOVE CONSUMPTION.

Existing local conditions must determine the policy pursued by managers of all plants furnishing artificial light to the public. The same plan will not always be a success in every community; and a concise, comprehensive consideration of what is to be dealt with is as essential as the desired success itself. Nor is this paper given the Association for the purpose of intruding personal plans, or offering suggestions to be followed, but rather in the spirit of provoking subsequent discussion, that may prove of practical benefit to members who have not, for good reasons, strayed from the old beaten paths.

In what follows the fact must be borne in mind that the situation in North Adams is somewhat peculiar. The Gas Company has a very small capital, and it operates a combination plant, where no market for coke affords a valuable item in fuel for electric boilers, so economy is found in one direction by what might be a risk to other companies, in making a marked difference in the selling price between gas used for lighting and for mechanical purposes.

Being led to see the advantage it would be to us, could our day consumption be materially increased over the considerable amount already then used by the mills and print works for the purpose of singeing—as to all our manufacturers we have always given a special price—I made what was considered to be a heroic effort to induce our patrons to adopt the use of gas stoves. This was four years ago, and we were selling at a net price of $1.85 per 1,000 cubic feet. Generous advertisements were given each local paper, and a competent teacher of the art of cooking entertained and lunched a well-filled public hall twice during the early summer, resulting in the sale of some 25 ranges at a fair profit to the Company.

Their operation was successful, but the bills proved burdensome to the customers, and the use of the stoves was promptly discontinued upon the approach of the first cold days in early autumn. The next year saw no increased popularity for gas stoves, and our sales were but 15 ranges.

Determined that our good people, cut off by their locality from many enjoyments that are found in this fair city of Boston, and elsewhere, should, at least, have the opportunity to prove that my ideas of the gas stove business were not altogether wrong, we reduced our general price, July, 1895, to $1.75 per 1,000 cubic feet, made a special price of $1.40 for mechanical purposes, to be used through a separate meter, without restriction as to amount, and offered to sell and connect gas ranges at cost. The scheme proved a success. That season we sold 62 ranges, and, with the same prevailing prices, last summer 50 more were set, with the gratifying evidence that the stoves are used daily every month in the year. I have urged the larger sizes, 3 and 4-plate ranges, whilst many have the hot water attachment as well.

The gas stove business means more work, more labor, more expense. Demands a stock in hand, a good piper, a clever salesman in the office who will see that full explanation is made to the users after the stove is set, and an enormous amount of patience.

We deliver the stove, furnish pipe, labor and meter, for the following prices: $10, $12 and $14 for a 2, 3 or 4-plate range, respectively, and our Company has obtained credit for fair dealing, and incidentally secured a considerable increase of very desirable business. Upon some settings we obtain a fair profit, others, we neither make nor lose, whilst there are many with a considerable expense; but in my opinion you can have only one method.

The following will show the actual results from our effort toward $1 gas, and the monthly sales are exclusively for gas stoves, fed by separate meters at a special price of $1.40 per 1,000. More than 75 per cent. of our house meters are taken quarterly, and where it is a physical impossibility for a second meter to be used on the system of piping found

in the house, we make the bill, for July, August and September, at the special price, to include consumption for all purposes. This seems to be satisfactory for such emergencies.

1896.			
January.....	62,200 cubic feet.	August.....	132,900 cubic feet.
February....	60,300 "	September ..	556,400 "
March	159,600 "	October	127,000 "
April.....	73,400 "	November...	103,000 "
May	71,000 "	December...	291,700 "
June.....	259,700 "	Total..	2,023,700 cubic feet.
July.....	126,500 "		

For this was paid $775 for 140 meters, an amount for trucking, extra labor and advertisements; but to this Association it is unnecessary to say that an increase of over 2,000,000 cubic feet in day consumption, in one year, upon a make of 26,000,000 cubic feet, is extremely desirable, and not without profit.

The coming season we shall make a reduction to $1.20, and push the sales even more vigorously, as, at that price, gas is cheaper than coal at $5.50 per ton, and, as I reminded you earlier, the more coke we have to burn the more profit for the year. Our experience proves that the use of separate meters, and a special price for mechanical purposes, had been a very wise and profitable course, and one to be continued.

Aside from what might be counted a selfish motive, a good gas range properly set is the greatest comfort for the fairer side of a household. It is a positive economy when carefully used, and every manager can count himself as engaged in a truly honest and philanthropic crusade when attempting to educate a community to increase his sales through this medium.

Low selling prices result in greater patronage. The more apparent it is to the public that you are making honest, unsolicited efforts to reduce the price per 1,000, and improve the service at the same time, the more friends can be counted for your company; and I am not sure but we ought, in this business, to be satisfied in feeling that,

"A good name is rather to be chosen than great riches."

Discussion.

The President—Gentlemen, this paper should have interest for you all, since it deals largely with the question of special price for gas stoves. There is a wide difference of opinion in regard to this subject. Mr. Nettleton, if you have experimented with a separate price for gas stoves, I will be obliged if you lead the discussion.

Mr. Nettleton—Mr. President, I regret that you called on me first. I have had the matter under consideration for a number of years, and it has seemed to me until very lately that it was not a good plan to go into. And yet my reasons are purely theoretical. My ideas have been that we would have trouble from people who were using large quantities for light and paying a higher price than those who were using a comparatively small amount for fuel or mechanical purposes, and that a man could with justice say, "It is the same article, and you are charging me $1.50, and you are charging my neighbor $1.20 or $1." They could with justice say that it was unfair treatment. Of course, the answer to that, as we all know, is, that it is using the mains in the daytime, that the consumption is largely in the summer, etc. That was a question which I did not have the courage to meet, and so I drifted along, selling gas as cheaply as I thought we could afford to, and meeting with a fair degree of success. You have in the neighborhood of 600 families, and out of those over 400 have ranges. But, as Col. Richardson has said, those stoves are not used the year round—they are dropped after the summer consumption; and I do not believe that our stoves average more than $12 or $14 each per year. Of course, I have no means of getting at it accurately, because we supply gas for light and for stoves through the same meters. It has seemed to me, I say frankly, that I have made a mistake, and I propose to advise my Directors in the near future—I do not know whether they will act on it—to make a special fuel price. I believe all the companies that have tried that plan have made more money by reason of a special price than those who like myself have kept out.

The President—Mr. Fowler, what have you to say on this subject?

Mr. Fowler—The gas range business in Springfield was practically started in the late '80's, about 8 years ago. Since that time, with now nearly 6,000 meters set, we have probably placed 1,100 ranges alone, exclusive of other gas stoves. For the last seven years it has been the rule to sell a stove at cost, and to put in a separate meter to register the gas going to that stove; but the customer pays for a separate and independent pipe from that meter to the range. If 10,000 feet or over be used in the range, then a discount is made on the price of gas to $1.25 net. Now, under those terms, though we have set in the time I speak of, that is, in the last seven or eight years, more than 900 ranges, certainly not over 125 people took advantage of that offer, that is, the offer of gas at $1.25 has not seemed to be desired, or to be very acceptable to the public. They had rather pay our regular rates, which, up to 1893, were $1.75 a thousand; from 1893 to the present time the price has been $1.40 net. We personally do not see the advantage of setting separate meters for fuel consumption. Some years ago the subject came up at a meeting in Boston of several gas men, and I then made the statement that the average gas range with us used about 1,000 feet of gas per month through the summer. That amount I derived from a reckoning I took of a certain quantity of ranges. Taking a certain number of ranges which had been set in the fall of one year, I found that the increase of gas consumed by the parties who had those ranges in their houses was just 1,000 feet a month the next summer. In talking it over with one or two other gentlemen here, I believe they came to the same conclusion. I believe Mr. Waldo Learned has had some experience on separate meters.

Mr. Learned—Mr. President, some 8 years ago, when the price of our gas was $2.80, we adopted the policy of putting in separate meters. I must confess that I didn't think very much of it at the time, and when our price got down to $2 a thousand we abolished that method altogether. It was not wholly satisfactory. Our price was $2.80, and the fuel price was $2. We thought, with that 80 cents rebate, we could encourage a great many customers. As to the consumption, if I remember correctly, the average in summer was about 2,800 feet per month, and in winter about 400 or 500 feet per month. The best method we found to introduce gas stoves was to put a man on the road to drum up the trade. He would go to each individual customer and try to sell some gas appliance, and at the same time to find out if anything was the matter with the gas; if they had any complaints to make as to the ranges, the quality of the gas, or anything else. Although we didn't sell so very many stoves, yet we think we put the public in touch with us by adopting that method. A great many complaints that came to us in that way, were attended to promptly and we do that about once in three years. About April, this year, a man will go on to the road and see every customer of ours. To-day we are selling for $1.35, and I feel that there is no necessity for any separate meter. If a party requests a separate meter for his own benefit, for information, why, we put it in for him; but I do not think we have over one or two calls a year for a separate meter.

Mr. Coffin—When we sold gas for lighting purposes at $2, our stove business was comparatively small. We advertised, when it was used for domestic day purposes and for mechanical purposes, we would sell at $1.50, and we followed that line out until we reduced the price of all our gas down to the mark of $1.50. Then we did not make any special price from that time out, and found that by selling stoves at cost and setting them free, taking what it would cost for the maintenance of the meter and maintenance of a separate cock, our judgment was that that same amount of money expended the same as Mr. Learned speaks of, in drumming up trade, would give us a greater return. We have been selling gas now for three years for $1.40; and I think we have only two cases and they are quite large consumers, one is a restaurant and the other is a hall where there is a good deal of gas used, where the users asked for a separate meter, merely to know what part of their gas was burned in the stove. We very readily complied with both of those requests. We rather felt that a man might complain, when he used several hundred dollars worth of gas for lighting purposes, that he was rather discriminated against, if a man who burned $12 or $15 worth for other purposes got it at a much less price. So we have rather averaged the thing up and reduced the gross price as fast as we felt was safe; and, being almost wholly the same customers in both cases, they do get a reduction in their gas.

Mr. Richardson—I agree with Mr. Coffin, but this point it seems to me should be kept in mind: If you can sell everything under $1.25, you can say with truth, and prove it to your customers, that it is cheaper to use for all purposes in the kitchen than coal at $5.50. But, unfortunately, we have not volume of business enough, and in our location it is impossible to put the price at that figure at present. Yet, from my experience and from the peculiarities of human nature that you see in every community, I honestly believe if I were able to sell gas at $1, I would make the price at least 50 cents for fuel, if I couldn't get it any other way. Everyone would be anxious to become a customer, because the people would all feel, even if they were paying so much money for lighting, that they were getting something that was a benefit and a comfort at a great deal less than they would be enabled to if they used it with one price; and, whether it is my good fortune or whether it is the peculiarity of the people in our community, we have had no

complaint about the point of difference in the selling price. It may be wholly a freak of nature, due to the elevation of the town, or something else, but the fact remains that we have not been criticized about that one point. Certainly our experience, in a very small way, showed a generous response from the public when, in 12 months, the lowest consumption for gas stoves, and that in the winter month of February, fell to 60,300 feet, while in the month of September they turned us in the revenue from 556,000 feet. They are used every month; and I think if it was $1, 90 per cent. of our gas consumers would have a gas stove. It is a peculiar fact that a large per cent. of the ranges, mostly of the 3-plate type, are used by people of moderate means, who live in the smaller houses, and, as a rule, are working upon a salary either in the shops or in stores. The people who own their houses, with very rare exceptions, are not gas stove users. I believe thoroughly in the practice, and entirely from our own experience. Perhaps if we were able to sell at $1 it would not be necessary; but I still think I would give a discount.

Mr. Hassett—In the small Company (Beverly, Mass.) with which I am connected, we adopted the policy six years ago of setting separate meters. We were then selling our gas at $2.40, and we made a separate price for gas stove consumption of $2 net. We sold the stoves at cost and ran a pipe (¼-inch) for 3 cents a foot. It has worked very well with us. The first year I think we put in 4 stoves, the next year 30, the fourth year about 50, and we have now in use about 200 stoves. The number of our consumers is about 600. I found it worked very well in this way: In small places like Beverly all the consumers are usually known to the gas men. While walking along the street, perhaps in a hot day, meeting a man I would say to him, "You ought to have a gas stove." "Oh! I can't stand that." "Well, how much do you think it will cost you?" On his replying, "I don't know," I would say, "Well, now, there is your neighbor; he is running a gas stove. It costs him between $2 and $3 a month in the summer time." This would surprise him, and very often such men would have me set stoves for them. We changed, after we got our gas stove business well established, and reduced the gas rate to $1.80, and took out all our gas stove meters. We had no difficulty; the consumers didn't seem to mind. People generally knew about how much it would cost to run a gas stove. I remember the case of a lady (her brother was in the coal business) who had a gas stove set. For a month she ran a coal stove, and taking account accurately of the wood and coal used, and found that the gas stove, with gas at $2 per 1,000, was a shade cheaper for her than coal. The average consumption through the gas stoves that we set the last year before we changed the meters would be about 7,000 feet for the 12 months.

Mr. Morrison—Our experience in Concord, New Hampshire, has been parallel with that of others. Beginning four years ago, with gas at $2, and no fuel consumption, we started in, putting the fuel consumption at $1.50 and setting separate meters. The result has been excellent. Up to last May we held to that scheme, and then reduced the price of illuminating gas to $1.50. We now have a consumption per year for fuel purposes of about 8 million feet, as against nothing four years ago. I believe that, with a high-priced gas and no fuel consumption, the way to introduce it is to give a separate meter and a low rate for fuel, and in the course of time cut the other rate to meet it. We find the cut in the illuminating rate made last May has very materially helped our fuel as well as our illuminating business.

Mr. Coffin—I would like to ask the members if they ever experienced any trouble in having connections made, especially in basements? In a number of cases we have had that experience. On going to look at the meter, we found in two or three instances they had got on to the fuel meter. It was always a mistake; but they got there every time.

Mr. Richardson—I can answer that. I presume we have had a dozen such instances; and each time I have said, "Just put the burner right on your stove or heater, close to where you want to use it, always;" and I will tell you why. If that gas consumer thinks he is getting the best of the gas company he is happy; but that man will use twice as much gas, and will be your friend, and it won't cost you a cent. (Laughter and applause.)

Mr. Morrison—Mr. President, I think that is good policy. Where we get a new consumer, we run the service up back in the kitchen for nothing, put it on where he must use it, and it pays. It means an investment perhaps of 50 or 60 cents; but it pays.

The President—I understand Mr. Sargent has had some success in introducing stoves in Lawrence, Mass.?

Mr. Sargent—Mr. President, at the present time we are selling gas for $1.30 net, both for illuminating purposes and for stoves. About three years ago we sold gas for illuminating purposes at $1,40 net, and for stoves at $1.30 net, but we had separate meters. Well, we got into trouble. There were customers, like the Opera House and hotels and such places, using a great deal of gas, who thought they ought to get it as low as people who used ranges. So we did away with setting separate meters and sold all our gas at $1.30 net. Now we are contemplating whether we will sell gas for fuel purposes lower and put in separate meters. We have not quite settled the question yet whether we will or not, so I am just listening to what the other gentlemen have to say. Later on perhaps I can say something about it.

The President—Mr. Sherman, can you say something on this subject of separate meters and special prices for fuel gas as compared with illuminating gas?

Mr. Sherman—The price there is $1.25. We have recently reduced it, from the first of January, to $1 for fuel and engine purposes, and put in separate meters. There is no mistake in erring on the side of liberality. If you want to build up a business, you have to do the same as other people who have goods for sale, advertise them, and drum and use the same means for selling your goods that other folks do. You will get there if you do that. (Applause.)

Mr. Sargent—I would add we have had very good luck in Lawrence in selling gas ranges in the last three years. I think the first year we sold in the neighborhood of 140; year before last we sold about 190, and last year about 220. They are all giving good satisfaction, and I think the coming summer will be above any of the preceding summers, because people are getting on to it, and are liking them very much. But there is a great deal of fault finding in our city, because our neighbors around us are selling gas cheaper than we are. People won't buy ranges until we get our gas down to the price of the gas our neighbors are getting. So it remains to be seen what happens in the next two months.

Mr. Fowler—This question of attributing the increase of consumption in gas ranges solely to the price of gas, reminds me of what the Chairman of the Gas Commissioners said last night in his speech—I wish I could quote it exactly, but the gist of it was, that the people in their use of gas were not so much moved (were not so much affected) by the price at which they obtained the commodity as they were by the way in which it was handled. I can't quote him exactly—if any of you could tell me what he did say about that? (Laughter.) Well, you all clapped applause because it was in agreement with what we all think, that the price of gas really does not have so much effect on our output, but the way in which our customers are handled does have a very great effect on the putting out of gas ranges and on the consumption of the gas.

Mr. Richardson—I agree with Mr. Fowler, although I cannot tell him what the Commissioner did say, because I was not there. But that would apply to the price of gas in my opinion, up to $1 and possibly $1.10, but it does make a difference when you go above $1.40. If you can get your customers to believe you are trying to do them a favor, you will find, in my opinion, that after you get them as customers, the more meters you set, separate from lighting, the more consumption will increase, and then if you are able to reduce to $1 for all purposes, you have the public on your side. But above $1.40, in my opinion, it does make a great difference; it certainly did with us.

The President—Is there anyone with us who cares to speak on the sale of gas stoves or the giving away of gas stoves in Boston. Mr. Addicks?

Mr. Addicks—Mr. President, I did not have the pleasure of hearing the paper read, but I have some idea of what it was from the remarks. I merely want to say that some time ago I had occasion to look over the report of the Board of Gas and Electric Light Commissioners to investigate somewhat in regard to the percentage of the consumers to the population, and I found that North Adams led all the small towns in Massachusetts. Therefore, I think the gentleman who read the paper speaks with authority.

The President—Mr. Addicks, I do not know that you want to speak on the introduction of gas stoves and the consumption of gas due to them?

Mr. Addicks—Mr. President, I was not prepared to speak on it, and you will pardon me, as I am not properly fortified to do so. I can only say in a general way, somewhere about 50,000 are used in Boston, and there are some 75,000 consumers, so you can draw your own conclusions from the figures.

Mr. Gifford—If it is allowable at this time, I would like to inquire whether this special price for gas has, in the experience of any of the members, increased the gas engine trade to any appreciable extent?

The President—You hear the question of Mr. Gifford. Have any of

the gentlemen anything to say about it? Mr. Gifford, have you anything to say on that subject yourself?

Mr. Gifford—I do not know that I can say anything about gas engines, because we have no gas engines in our town; there is a fatality in the salt sea air or something else that knocks them out when they are installed. At the present time we have no gas engines except those running in the shops of the gas company. Our price for gas is so low that no reasonable man certainly ought to ask for any special price for any purpose. We have, I might say, a large discount for a small consumption; that is, we have 10 per cent. off on all bills promptly paid, and 25 per cent. off on a consumption of 4,000 feet per month, so that the large discount enters into the ordinary stove use.

Mr. Neal—In answer to the question, I will state that the Company I represent is furnishing gas for 13 gas engines. The prices range from $1 to $1.25, and they are all very much liked. Some of those were put in in order to avoid the necessity of putting in a power plant of electricity. And I will say, one thing I happen to think of is that we are very much indebted to the liberality of the Boston and Brookline Companies for furnishing our stoves, because we have several of those very stoves, in our district in Somerville, doing excellent service. (Laughter.)

The President—That is rather amusing, because I have been told that a very careful record is kept of every stove that has been given away, and that the Companies could lay their hands right on it, and call the man right in when they wanted to.

Mr. Coffin—Mr. President, we have some of the stoves some 30 or 40 miles from Boston; but the parties came by them honestly. They took them under an agreement that when they had burned $25 worth of gas they became their property. That was, I believe, the first arrangement in Boston—so I have been told. Wasn't that the fact, Mr. Addicks?

Mr. Addicks—That was in connection with the Brookline Company. I am not informed as to what was done. The Boston Company, however, did not do that.

Mr. Coffin—I would say they came to our town straight, and belonged to the parties. They burned gas in Boston, and when they moved away they brought the stoves with them.

The President—I always thought the policy of the Boston Company was liberal, but this giving away of stoves all over the State is even more liberal than I thought it was at the start.

On motion of Mr. Nettleton a vote of thanks was tendered to Col. Richardson.

Mr. C. W. Hinman, of Boston, Mass., read the following paper on the

MEASUREMENT OF GAS.

To determine the amount of gas contained in a given receptacle or flowing through a conduit, it is necessary to give considerable attention to various conditions that, in the case of the measurement of solids and liquids, demand little or no attention. When liquids or solids are measured the pressure on the substance usually need not be considered, but for accurate results it must be considered when gases are to be measured. For example, a change of pressure of 1 ton per square inch will not produce as much change of volume in one of the weaker woods as will a change of pressure of 1 ounce per square inch on a gas. Liquids are scarcely more compressible than solids. Temperature must be taken into account in the accurate measurement of either solids, liquids or gases, but produces a much greater change in gases than in either solids or liquids. For example, an increase of 1° expands a gas more than 43 times as much as it does lead, the metal most affected by heat, or 340 times as much as it does porcelain, or 8 times as much as it does water.

In order to know the quantity of gas contained in any receptacle, we must not only know the volume of that receptacle, but we must know the temperature of the gas, the pressure under which it is confined and the amount of other gases or vapors present. In accurate measurements it is necessary to take account of the expansion of the receptacle itself by heat, but it is usually constructed of such materials that pressure or moisture has no appreciable effect on it. If gases are so much more readily affected by variations of pressure and temperature than either liquids or solids, they have the very convenient property of being all affected the same amount by any variation of either temperature or pressure.

The volume of any given quantity of gas is inversely proportional to the pressure on the gas. That is, if the pressure is doubled the volume is halved. We may say with some approach to accuracy that, at the ordinary atmospheric pressure, an increase of pressure of 4 inches of water diminishes the volume 1 per cent., or a decrease of pressure of 4 inches of water increases the volume of gas 1 per cent. All gases expand 1 per cent. for each 5° increase of temperature, the unit of volume being taken at 42° F. This is very nearly true of all gases, but only on condition that they are dry or do not contain vapors. When a gas is in contact with a liquid the liquid dissolves a part of the gas, and the vapor of the liquid mixes with the gas and apparently increasing its volume. A gas in contact with water, or saturated with aqueous vapor, will contain, at 43° F., 1 per cent. of aqueous vapor; at 64° F., 2 per cent.; at 77° F., 3 per cent.; at 86° F., 4 per cent.; and at 93° F., 5 per cent. Or, if we consider a gas in contact with water, and saturated with its vapor, the gas will seem to expand at ordinary temperature 1 per cent. for each 3½° F. It is highly desirable in measuring gas to alter neither the pressure nor the temperature and so avoid all corrections.

Amongst the sorts of apparatus used to measure gas the most nearly accurate are those used in analyzing gas and having mercury as a sealing liquid. Mercury has the great advantages over other liquids used for sealing gases of not exercising a solvent action, of not wetting glass, and of having practically no vapor at ordinary temperature.

If water is used as a sealing liquid, it adheres to the tube and also dissolves a sensible quantity of gas. If gas of a constant composition is measured the liquid gets saturated with gas and gives no farther trouble in this respect. A good example of accurate measurement, using water as a sealing liquid, is the English pattern of standard cubic foot measure for gas.

In this apparatus the copper measuring vessel is nearly a cylinder with hemispherical ends, and provided with a gauge glass at each end. In use it is first filled with water, the gas being drawn in by allowing the water to run out at the bottom down to the gauge mark. Water is again admitted at the bottom, and expels just a foot of gas when it reaches the gauge mark at the top. In the Massachusetts form of cubic foot measure, the whole bulb dips into a tank of water. This is a very convenient form of apparatus, but the evaporation of water from the surface of the bulb lowers the temperature of the air within, and so produces inaccurate results. This makes it necessary to use it only when the surrounding air is nearly saturated with moisture, and so there is no tendency to evaporation. The standard cubic foot measure is the foundation of all measurements of gas, either at the works or at the consumers, and so should be constructed so as to be extremely accurate, and also capable of giving accurate results under ordinary conditions. In this country, so far as I am informed, the cubic foot measure is used only to graduate meter provers; but in Great Britain it is used to test photometric meters. I consider this last use of the apparatus as unnecessary and not well advised, as a photometric meter needs only to have its water line kept adjusted, and an observation made occasionally to see that it works smoothly at not over 2-tenths of an inch pressure, to register accurately for years.

The meter prover is a cylindrical shell of sheet metal closed at the top and sealed below by a tank of water, the cylinder being held in an upright position by guides, up and down which it freely slides. Gas or air is admitted to the inside by an inverted siphon and inlet and outlet valves. One or more connecting tubes, pressure gauges and thermometers are provided. It is not absolutely necessary, but it is decidedly advisable, to have the gas in the prover under the same pressure, whatever may be the position of the bell. As when the bell descends it displaces its own volume of water and is buoyed up to this extent, it is obvious that some means must be found to add to the weight of the bell as it descends. There are three ways of doing this:

1st, by means of a chain attached to the top of the bell and passing over the wheel, and provided with a handle and weight at the other end. The chain is also used to pull up the bell. If this chain is made of the right weight, enough of it passes from one side to the other of the wheel to keep an even pressure as the bell descends.

2d, by means of a weight suspended from a cord that winds onto a curve of such a form that the leverage of the weight on the axis of the wheel increases uniformly as the bell descends. This curve is usually spoken of as a cycloid, but it seems to me that it should be the involute of a circle.

3d, a weight revolving with the wheel from one side to the other according as the bell is up or down. This method is only approximate. Usually all the methods are combined in the same prover, as there is usually a chain, but not nearly heavy enough for complete compensation. The weight and curve are usually present, and as the metal forming the curve is not usually balanced, the third method has some influence.

Meter-prover tanks are frequently made annular. This is so as to reduce the total weight of the apparatus, to allow the apparatus to quickly take the temperature of the surrounding air, and because any

change in the pressure gives less movement of the bell than when the tank is plain.

It may not be out of place to say a few words about the testing of the gas meters. The first preliminary is to bring all parts of the apparatus and the meters to be tested to one common temperature. This way will take some hours. If we assume the air or gas used in testing to be two-thirds saturated with moisture, each difference of 1° of temperature between the prover and the meter makes one-fourth of one per cent. difference in the result of the test. The meter is connected to the outlet pipe of the prover and tested for a leak, by closing the outlet of the meter, opening the prover cock, then closing it and noting if the pressure gauge shows any diminution of pressure. The meter is then run until the testing band is just at one of the marks on the dial, the pointer on the meter prover brought to the zero on the scale, and the meter run until the testing band has returned to the mark from which it started. The legal rate for passing gas when testing a meter is 6 feet per hour for every light the meter is marked for. If the meter is tested at only one rate the legal rate is the one chosen. It is well to test on all meters at a one light rate, and also at a rate two or three times the legal rate. It is scarcely to be expected that a meter, especially one that has been in use, will register exactly the same at the various rates, but the difference in registering should be small. A question frequently asked is, "What should be the pressure on the prover when testing a meter for accuracy?" The usual pressure is 1½ inches of water, but the test may just as well be made at any other pressure, if the rate be adjusted correctly, and there is sufficient pressure to run the meter at that rate. For example, a 10 light meter in good working order, tested with air at the rate of 60 feet per hour, requires about two-tenths of an inch more pressure at the inlet than at the outlet, and this pressure required to run the meter at the given rate depends not at all on the initial pressure but on the construction of the meter.

There are at least four essential requisites for a gas meter. The first one is a negative requirement; and is that the meter shall not leak gas. The second is that the meter shall register gas. The third that the registration shall be fairly accurate, even if the meter is used for a considerable length of time. The fourth is that the meter shall not take too much pressure to run it, or deliver the gas under a pressure that fluctuates too much. I think we may say that the large majority of meters now manufactured meet their requirements when they are used under fair conditions. The first and second requirements, although so essential, are readily obtained with good workmanship and careful inspection. Various conditions influence the accuracy of a meter. In a dry meter the valves are of great importance, but the diaphragms are still more important. The main points in regard to the valves are that they shall be accurately ground so as to shut tight, and that they shall be set accurately, especially as regards the regulator. This adjustment is made with considerable care by the manufacturer, but frequently when the meter is repaired the lead of the valves is altered to adjust the meter, when the adjustment should have been made by altering the length of the regulator.

Diaphragms are made of thin leather, usually sheepskin, and saturated with oil. It is essential that a diaphragm shall be flexible, and yet not pervious to gas. I find no reason for supposing that a diaphragm becomes more flexible after being in use than when it was first made, but diaphragms that have been in use for some time sometimes contract and become less flexible. This change may be due to several causes. It may be due to some change in the leather or oil, although I have never seen a change that seemed to be due to this cause alone. It may be due to the action of the ammonia in the leather; this was common some years ago. It may due to the action of light, oily vapors and particles in the gas that dissolve the oil out of the diaphragms. It may also be due to the deposit of heavy tar on the diaphragms. Diaphragms have been known to be in good condition when the gas was well purified after 20 or 30 years' service, and they have been known to be unfit for use when the gas was not purified or condensed after a service of as many weeks. I am inclined to think that the longevity of a diaphragm depends more on the kind of gas it comes in contact with, than it does on the kind of stock used in its manufacture. All oils are to a certain extent soluble in naphtha, and anything flexible is rendered stiff by deposits from some sorts of gas. An illuminating gas, poor in illuminants and free from ammonia, vapors and tarry particles, would seem to be an almost ideal atmosphere for the preservation of leather.

The pressure required to drive a meter is used up in two different ways. One part is used up in overcoming the friction of the various parts of the meter that move over other parts, and also in overcoming the stiffness of the diaphragms. The pressure necessary to overcome these resistances varies little with the rate at which the meter is passing gas, and may be readily measured with an approximation to the truth by observing the pressure necessary to just continuously move the meter. In new meters it does not seem to exceed ¼ inch. The other part of the pressure is used up in overcoming the resistance of the gas in being forced through the various passages in the meter. Theory says that the quantity of gas forced through a given passageway is proportional to the square root of the pressure required to force it through, and inversely proportional to the square root of the specific gravity of the gas. My own experiments show that this theory is quite applicable to the passage of gas through the channels of a meter.

The various sizes of meters are called 3-light, 5 light, etc., but the name does not give an exact indication of the amount of gas the meter will pass. For example, a 3-light meter is not overloaded if it measures gas for nine burners, each consuming 6 feet per hour. There is no uniform relation between the nominal and the actual capacities of the various sizes of meters. A 3-light meter will supply nine burners with about the same loss of pressure as a 20-light will supply 30 burners, or a 150-light 150 burners.

The various makes of meters vary more or less in capacity, but in the following table I have endeavored to give the capacities of about the average meters of the three smaller sizes. I think it does not give the exact capacity of any one make of meter, but is near enough the truth for the large majority of meters made in the United States, so that it can be used without serious error. The pressures, as given in inches of water, are the amounts by which the pressures at the inlets exceed the pressures at the outlets. The proportionate capacities for the various pressures are the results of actual tests. The results for the three different gases are partly calculated and partly observed; water gas being assumed to have a specific gravity of .64, and coal gas of .42. The results are given in feet per hour to the nearest foot, but the last figure is not generally to be relied on. (See table on opposite page.)

We have now to consider the question of what is the capacity of a gas meter—a 3-light, for example; or, in other words, how much pressure is it allowable for a gas meter to use up when working? I think the general practice is to set a 3 light meter, when not more than from 8 to 12 burners are to be used. If we allow 6 feet per hour for each burner, these quantities correspond to pressures of from .24 inch to .53 inch as extremes, with the various sorts of gas given in the tables. We may average these and say that a meter should not take more than .4 inch pressure when passing gas. There is a very good reason for not working a meter at more than .4 pressure. When gas enters a meter at a constant pressure, it is delivered from the meter at a fluctuating pressure, and this fluctuation amounts to about one-third of the pressure absorbed by the meter. Gas entering a meter at 2.0 pressure, and leaving it at 1.6 average pressure, will have a fluctuation of about one-tenth the whole pressure at the outlet of the meter, and this is as large as is desirable.

Let us consider the case of a gas stove or range. A large range with all its burners lighted may easily consume 100 feet of gas per hour, and a small range 60 feet per hour. Consulting the table for mixed gases and a 3-light meter, we see these quantities correspond to loss of pressure of .79 inch and .37 inch. If we again consider the gas supplied to the meter at 2.0 pressure, we shall have, for the large range, a pressure of 1.21, which is sufficient to supply the range, and the fluctuation of ¼ inch does little harm to a heating flame.

We see from this that when a separate meter is used for a gas range a 3-light will in most cases be sufficient. Let us consider the same conditions as before, except that a 3-light meter is used to supply the gas used for both lighting and cooking. Six gas burners at 5 feet per hour, and a small range with the burners all lighted, give a consumption of 90 feet per hour. This gives a pressure at the outlet of the meter of 1.34 inch (as the loss of pressure from the meter is .66 inch), and a fluctuation of, say, .3, or more than one-fifth of the whole pressure. That is, the fluctuation is more than twice as much as practice has shown desirable. This would seem to indicate that a 3 light meter can seldom be employed to advantage where a gas range and gas for lighting are supplied from one meter. A 5-light meter, as shown by the tables, will deliver 90 feet of gas per hour, with a loss of pressure of only .4, or where practice has set the limit. If we consider a large range and six burners supplied by a 5-light meter, we have 130 feet per hour, and a loss of pressure of .7 inch, and the fluctuation is too great, indicating that a 10-light meter should be used in the place of the 5-light; the tables showing that the 10-light meter should give a loss of pressure of less than .4 inch.

It has already been mentioned that, for the proper preservation of dry meters, they should be used only for measuring gas that has been

Water Gas.

Pressure.....	.2	.3	.4	.5	.6	.7	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5
3-Light.....	34	47	59	69	78	85	92	99	105	110	115	121	126	131
5-Light.....	47	66	82	97	109	119	129	138	147	154	162	169	176	183
10-Light.....	70	99	123	245	163	178	194	207	220	231	242	253	265	275

One-Half Water Gas and One-Half Coal Gas.

Pressure.....	.2	.3	.4	.5	.6	.7	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5
3-Light.....	37	51	64	76	85	93	101	108	115	120	126	132	138	143
5-Light.....	52	72	90	106	111	130	141	151	161	169	177	185	193	201
10-Light.....	78	108	135	160	176	195	212	227	241	253	266	278	290	301

Coal Gas.

Pressure.....	.2	.3	.4	.5	.6	.7	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5
3-Light.....	41	58	72	84	95	104	113	120	128	134	141	147	154	160
5-Light.....	58	81	101	118	133	145	158	169	179	188	197	209	215	224
10-Light.....	86	121	151	177	199	217	237	253	268	281	296	313	323	335

thoroughly and properly condensed and freed from ammonia. If meters are set in too hot a place the diaphragms become stiff and contract. If they are set in a place cooler than the entering gas, they become filled with condensed liquids.

Discussion.

The President—This is a question that every man in the business has to do with. There are various ways of measuring gas. Some men, in measuring gas at their stations, have the water line in the meters high and others low, to affect the loss by leakage and condensation. Other men want that water line exactly right, and then they want meters that are exactly right. Then if they have a good gas put out at proper temperatures they know what they are doing. I am sorry to say some men have different ideas in regard to this thing, and like to help along, in one way or another, their loss by leakage and condensation; but Mr. Hinman understands those tricks, and he also knows how to measure *exactly* and get *accurate* results. I hope any of you will ask any questions you wish, or enter into any discussion upon this subject.

Mr. Addicks—I think we are all apt to run our meters to maximum capacity; and I would like to ask the opinion of Mr. Hinman as to the effect on the accuracy of a meter of pushing it beyond its capacity, or to its utmost, as regards correct registration; and also as regards the length of life of the meter?

Mr. Hinman—The meters sent out of the manufactory—I can speak for all manufacturers in this case—are intended to be adjusted so they will not vary very considerably at whatever rate the gas passes, even to a very extreme limit.

Mr. Addicks—I did not make my question clear. I mean after the meter has been in quite a length of time, not when it is new.

Mr. Hinman—I cannot quite answer that. Of course, after the meter has been used quite a while the valves may get worn a little, or something may give out that would alter the registration at different rates. I cannot say just what change would be made by long use.

Mr. Addicks—May I ask what the tendency to-day would be of running fast or running slow?

Mr. Hinman—Of course, any change that allows any gas to leak through, anything in the valve or any wearing of the valve, would make the registration slow, and that would be more apparent with a small rate than it would with a large rate. It might readily happen that a meter would not register at all on account of some small leak. I do not think that running the meter at an excessive rate really wears it out, except mechanically. If the parts revolve or slide very frequently, then, of course, to that extent the meter is worn out, but I do not think it is observable in practice, except after some time. It is certainly a good thing to keep the meter continuously in use. It is not a good thing to use it for a while, then lay it one side and use it again and expect it to be accurate. It may be; but it may not be.

Mr. Morrison—I would like to ask Mr. Hinman how often a meter ought to be removed and tested—as to whether there is a definite period?

Mr. Hinman—I think it desirable for every gas company, or anybody else using a dry meter, if they could see their way clear to do so, to test it once in five years, as I stated in my paper. I have known a meter to last 20 years and be perfectly accurate; but it may not last as many weeks. It depends entirely upon the conditions and what the meter was to start with; but from quite a long experience I think a period of five years would be about the proper length of time to let a meter stay in use without reinspection.

Mr. Nettleton—Mr. President, did I understand Mr. Hinman to say it was possible for a well made meter not to last more than 20 weeks, or 5 months?

Mr. Hinman—Yes.

Mr. Nettleton—I am sorry to differ from so good an authority, but I dislike to have such a statement go out without entering my protest. In all my experience in buying meters I have never had a meter—and I think that must be the experience of the gentlemen present—give out in anything like 20 weeks. I have tested my meters once in three years, for a dozen years, and we have an accurate account of every meter that we ever bought. The meters occasionally give out, but I think there is not one that has given out that has not run from 5 to 10 years. It must be something extraordinary, something out of the ordinary run in the manufacture of gas, when a meter gives out after so short a time.

Mr. Hinman—Perhaps I had better say right here that I did not refer to ordinary purified gas, such as almost everyone sends out, but to gas such as I had seen. It is possible to load up gas with a combination of ammonia and oily vapors that will spoil any meter.

The President—I think it would be well to make that statement pretty emphatic, and to say what is the life of the ordinary meter, as used by gas companies in general.

Mr. Hinman—I should say 10 or 15 years was about the life of the diaphragms. The cases usually last about twice that length of time.

The President—Yes, I should say it would be that; and I think that should be clearly stated, because your first statement might be misunderstood, and it should go abroad that there was a possibility that meters might give out in a very short time, which would be unfortunate. In the general experience of most of us, I think we can say that gas meters are fairly long lived, and I think we can also say that meters as they are made to-day are unusually accurate pieces of apparatus; and, fortunately, a gas meter is a piece of apparatus that one can show up, and demonstrate to any person of fair intelligence that the method employed in the measurement of gas is simple and the results are correct. It is a very difficult matter to satisfy a person of some intelligence that an electric meter is correct. But I have always been extremely pleased that the accuracy of the gas meter was capable of demonstration to the general consumer. Possibly Mr. Hinman would like to add a word in regard to the accuracy of prepayment meters.

Mr. Hinman—There are quite a good many different makes of prepayment meters, and they are largely used in England. It is the ordinary dry meter, with prepayment attachment, and it consists in every one I have noticed of a money box, a prepayment movement and a shut-off arrangement of some sort. There are quite a number of these devices, and they have now arrived at such a state of perfection I think that you can consider them reliable. They are constructed so that you can arrange to give a different quantity of gas, according as you change the price of gas, while the meter is on the consumer's premises. And they have arranged a stop mechanism that brings up the meter bodily, or else with a valve that cuts the gas off slowly, and so gives the consumer a chance to go out and borrow a quarter. (Laughter.) They are quite largely used in New York city, and some of the other large cities in the country have introduced them. Of course, as the last resort, you have the ordinary dial to fall back on; but I think present experience is that the prepayment mechanism works satisfactorily without having recourse to the ordinary dial.

The President—Gentlemen, I regret that I am obliged to close the discussion of this paper; but we have quite a number of other papers, and in order that all the gentlemen who have taken pains to write papers

shall have a chance to present them and have them considered by the Association, I shall consider this discussion closed.

The Association then passed a vote of thanks to Mr. Hinman.

(To be Continued.)

SYNOPSIS OF THE PROCEEDINGS, FOURTH ANNUAL MEETING MICHIGAN GAS ASSOCIATION.

HELD AT THE COOK HOUSE, ANN ARBOR, MICH, FEB. 17 AND 18, 1897.

The meeting was called to order at 10 A.M. Feb. 17 by the President, Mr. W. M. Eaton, of Jackson, Mich.

ROLL CALL.

The following members responded to the calling of their names:

Active.

Beatley, H. G., Marquette.	Latta, L. M., Goshen, Ind.
Bostwick, W. J., Ypsilanti.	Morgans, W. H., Potiac.
Calhoun, R., Bay City.	Neuendorf, C., Saginaw.
Calkins, J. M., Big Rapids.	Raynor, C. H., Adrian.
Douglas, H. W., Ann Arbor.	Sterling, J. C., Monroe.
Dean, S., Owosso.	Tippy, B. O., Grand Rapids.
Eaton, W. M., Jackson.	Walker, J., Port Huron.
Fox, A. G., Marshall.	Walker, L. E., Lansing.
Gallagher, E. F., Ionia.	Ward, J. M., Battle Creek.
Hess, F. H., Ann Arbor.	Wolf, S. E., Jackson.
Howden, F. J., Muskegon.	Walbridge, H. D., Grand Rapids.
Hyde, H. H., Saginaw.	

Associate.

Bonney, W. P., Erie, Pa.	Persons, F. R.
Harper, H. D.	Roper, G. D.
Harris, G. E.	Wickham, L.
Osius, G. E.	

The reading of the minutes of the last annual meeting having been dispensed with, the

REPORT OF THE EXECUTIVE COMMITTEE

(Messrs. Wm. Eaton, H. W. Douglas and H. D. Walbridge) was read. The report recommended the election of the following gentlemen to membership in the Association:

Honorary.

Callender, E. P.

Active.

Baxter, I. C.	Dole, S. Milo.	Gascoigne, M. H.	Lynn, J. T.
Church, L.	Ellis, E. J.	Guitteau, T. B.	Webber, H. B.

Zwisler,——

Associate.

Corbus, T. G. Dwyer, F. T. Faulk, D. Green, J. D. Russell, D. R.

The Committee further recommended that the resignations of Messrs. G. L. Denham and Ira A. Ransom be accepted; and that Section 22 of the Constitution be amended, so as to read: "Sec. 22. The annual meeting of the Association shall be held on the third Wednesday, and the day after, of February of each year, at such place as shall be designated at the preceding annual meeting. Special meetings and executive sessions may be called at the option of the Executive Committee. By a majority vote of the Executive Committee, a vote of the Association may be taken by mail, and the Secretary is hereby authorized to enter the result of said vote upon his Journal as the decision of the Association upon the subject voted upon." The report of the Committee was adopted. The President then named as a committee to nominate officers, Messrs. B. O. Tippy, F. A. Fox and J. Walker. The President also announced that an executive session, for active members only, would be held immediately after the adjournment of the regular order of business of the first afternoon. The report of the Secretary and Treasurer (Mr. H. H. Hyde) showed that the Association had been well able to carry its financial responsibilities; also, that 62 members were on the rolls, classed as follows: "Honorary, 1; active, 41; associate, 20. This list, to which should be added the 15 names (1 honorary, 9 active and 5 associate) voted on at this meeting, goes to show how vigorous the growth of the Association is.

President Eaton then read his Inaugural Address. Owing to the particularly local bearing it had on certain State legislation, and Mr. Eaton's disinclination to making that comment public, we are prevented from printing the address. This we regret, in that it was a very interesting and cogent document. Secretary Hyde appointed Messrs. L. E. Walker, H. W. Douglas and Joseph Ward, a committee to consider the President's address.

Mr. L. M. Latta, Manager of the Goshen (Ind.) Gas Light Company, read the following paper on

ONE METHOD OF PLACING GAS STOVES AND WELSBACH LIGHTS.

At a meeting of this Association a year ago I was put on the list of contributors to this session, but the choice of article was left to me. There had been several interesting papers read at that time on the gas stove question, but none of them seemed to me to give actual results as achieved by any gas manager in his own town. What I mean to say is, that they were not definite enough as to the actual outcome of their attempts. After thinking over the subject for a few days I decided to see what could be accomplished by sticking to one method of placing stoves, and I will endeavor to tell you what I have accomplished.

I started at the beginning of the season and put in a little exhibition of gas stoves in our office. I never neglected to have all the burners on every stove lighted every evening, and always endeavored to have any one stopping to look at them come in and make a closer inspection. These talks with possible consumers resulted in many more failures than in successes, but I sold during the season 29 ranges. Of course, one of the first questions they would ask me was, "What will a stove cost me?" My reply was: "We will make you a present of this stove, or any other that you may select out of any catalogue, and will set it in your house free of cost to you ready for operation; or, we will sell you a stove at its list price and will also give you a receipt for $25 worth of gas, to be consumed in this stove subject to our regular rates." We did not limit the time in which this gas was to be consumed, but I will say right here that in no case did it run over eight months. The first offer was in no instance accepted, as the people seem to think it was a reflection on them to accept a gift from the gas company. The second offer was accepted, in every case of the 29 stoves which we set, with the exception of the fact that 13 of the consumers paid for the running of their services; the other 16 did not. I made the 13 pay for it, because they were amply able to do so, and for no other reason. I found, in nearly every instance, that the average consumption of gas in these stoves per month was 2,700 feet, or at the rate of 32,400 feet per year. This made us a gain in total output from these stoves of 939,600 cubic feet. These stoves cost us $420.50. The cost of running the services and attaching the stoves was $4.35 each, or $69.60 for the whole. This included everything. The cheapness of this service running may be partially explained to you by saying that the soil in our town is a sandy loam, and all the digging that is necessary for us in putting in the services is a trench 18 feet long, beginning at the main extending towards the sidewalk. From that point we wash our service right into a man's cellar, thereby saving a great deal of digging, and we never have had a complaint or any trouble with any of the services that have been washed in. I know this is considered poor practice in some places, and possibly is in localities where they have not the same advantage of the pretty soil to work in that we have, but with us it has been a success. The list price on the stoves which we set was $25. We received pay for them as soon as they were set and proven satisfactory to the consumer, usually within 10 days, so that the total cost of our investment, including cost of stoves and cost of services was $490.10. The return from the sale of the stoves alone was $725. Of course we had yet to furnish them with the $25 worth of gas, and deducting the cost of the stoves and the services from the amount received for the stoves alone left us a profit of $234.90, or 40 cents per 1,000 for our gas. The meters on these stoves were read each month, and receipted bills for the amount of gas consumed were rendered to each consumer, with the request that they credit it on the statement showing that we owed them $25 worth of gas. Then we charged up this gas at $1.25 a thousand against each stove, as that is what we always receive for gas used as fuel. Any of you can take the cost of the manufacturing of your gas and figure this same thing over and see where you will come out. We are very well satisfied with it and find in every case our customers are. We are now making preparations to continue this on a broader scale for the coming year, and shall offer to set a three-burner hot plate on the same terms that we have heretofore set ranges. Experience has proven that a hot plate is a very good advertising card for a gas range, and it is usually only a question of two or three months before a hot plate consumer comes in and wants a range. I hope that what I have said in regard to gas stoves will prove of benefit, or can be used by other members of this Association, as it is actual experience I have had in disposing of gas stoves for the past year, and I think the results have shown that, if a man finds, as I

did, it is impossible to sell gas ranges, some such method as this must be adopted in order to get them started.

In regard to the matter of introducing Welsbach lights. The first year we handled them we put them out on trial for people in order to introduce them, and at the end of the season our Welsbach light account showed $385 on the wrong side of the ledger. This was due to the fact that our gas was dirty, and constant stoppage of the lights and the necessity of the consumer's cleaning them every evening or so, soon wore out his patience, and they were brought back on our hands, or else thrown on the junk pile; but we kept hammering away at them, and at the end of the year the result was as I have mentioned. The next year we simply sold lights when some one came in and wanted them, but we never pushed them any where. We decided a few months ago to see if something could not be done. I will now give you our experience with one of our customers. Using incandescent lights, he was paying $16.40 per month for 28 lights. The service furnished him was not of the best, nor did the company seem inclined to help him out. Finally he became disgusted, and I heard one day that he was going to put in a private electric plant. I went to him and talked up the Welsbach light. Of course he was sceptical at first about what it would cost him, and, in fact, didn't want to have anything to do with it; but I hammered away and finally he asked me to make him a price to light his store by the year, the bills to be paid the first of each month, we to furnish the lamps and fixtures, take entire care of them, replace the burned out mantles and gauzes, and clean shades and chimneys at least once each month. I made him the price of 75 cents per lamp per month, which he accepted and we placed in his store 22 lights. We furnished the fixtures simply out of black iron pipe, and as cheap as we could make them, gilding them after they were hung and the lamps placed on, and to-day he says he never had as good light as he now has nor a light that is as cheap; and a number of stores in our town will probably adopt them in a few weeks, or at such time as their electric light contract runs out. To itemize the thing a little, I will give you the result of the month last past, that is, January. The consumption of gas in these 22 lights, burning from half-past four in the afternoon until nine at night, with one all night lamp, was, 9,700 feet. We replaced in the store during the past 30 days one chimney, at a cost to us of 6 cents, one mantle, at a cost to us of 32 cents, and our man spent four hours' time regulating some of the lamps and putting on this new chimney and mantle, at an expense to us of 40 cents, making a total expense for labor and repairs on these 22 lights for the past month, of 78 cents. We received for these lights the first day of the month $16.50. Deducting from it the 78 cents which we had expended, leaves us $15.72 for 9,700 feet of gas, or an average of $1.60½ per 1,000 feet, and as we sell gas right along for $1.25 I believe we are doing well. Of course these lamps complete cost us to start with $24.20. The 10 fixtures cost us 55 cents apiece, or $5.50. The labor of hanging these fixtures and placing lamps was 13 hours' time for fitter, at 20 cents per hour, or $2.60. The bronzing cost us $1.10, making a total cost to us of $33.40. We have a contract for a year with this party at this rate, and I believe that this method of service is worthy the attention of every gas manager who has either oil or electric lights to fight against. I am offering to install Welsbach lights, keep them in repair and furnish gas, in stores where they want only up to eight lights, at a price of $1 per month per light, and have now two places where these lights will be installed on March 1st. This latter price really gives on the face of it a better profit than the price of 75 cents per lamp, but I think the thing will be about even, considering the increased quantity of gas we will be enabled to put out through the introduction of these lights. I do not claim any originality for either of these methods, but I give them as experiences with a small plant in a small town.

A good discussion followed, which was terminated by a vote of thanks to Mr. Latta. Vice-President Douglas exhibited a letter of instruction printed on note paper, together with a receipt for "planking" fish, also printed on a separate sheet, but accompanying the letter, which he proposed sending to all users of gas ranges in his city, together with the necessary "plank." The President announced that Messrs. H. D. Walbridge, C. H. Raynor and J. T. Lynn had been appointed on committe on next place of meeting, after which the Association adjourned, to reconvene at 2 P.M.

First Day—Afternoon Session.

The President announced that as some of the gentlemen who had promised to present papers, through stress of circumstances, had been unable to prepare the same the Association would take up the "Topics for Discussion." The first of these, which was germane to the paper by Mr. Latta, was on "Welsbach Lighting and the Insurance of Mantles." This evoked a useful discussion, in the course of which Mr. H. W. Douglas informed the Association of the plan pursued by the Ann Arbor Company in the business section of that city. The appended form of "stipulation and contract," in respect of that practice, gives a clear idea of the Ann Arbor practice:

NOTICE.—WELSBACH LIGHT INSURANCE AND INSPECTION.

Realizing that to give the best service the Welsbach Light must be kept in perfect condition, and must be repaired by an experienced person, we will begin on the first of January a regular and systematic inspection and care of lamps at a regular fixed charge per month. This care will include the renewal of all mantles, chimneys and shades not carelessly broken by owners, and the cleaning of chimneys and shades; in short, the lamps will be kept in such a condition that not only the owners but the company will be proud of them.

The charges for this inspection will be based upon records kept in this office, and will simply cover the actual cost of such work. Weekly inspection will be made.

The charges will be as follows:

Saloons and restaurants	20	cents per month.
Groceries and meat markets	15	" "
Clothing stores, hats and furnishings	12	" "
Hotels	15	" "
All others not covered in the above	10	" "

Reserving right to increase these charges where special risk or hazard to lamps is involved.

Collections will be made by inspector on the last trip in each month, and terms will be strictly cash.

ANN ARBOR GAS COMPANY.

Form of Contract.

In consideration of.....cents per month for each lamp, the Ann Arbor Gas Company agree to insure against all breakage not due to carelessness of owner.....Welsbach lamps used by .....in his, their....., at No.....Street, for one year from date, and to inspect the same.....times per month, and to keep chimneys and shades clean, and whole lamp in proper condition.

(Signed) ANN ARBOR GAS COMPANY.

By.....

Accepted:

.....Dated.....189...

Mr. H. D. Walbridge also gave some valuable information in this connection, and followed it with some "Notes" on the comparative economy of Welsbachs over the best oil lamps, using best quality of kerosene oil. The "Notes" follow:

COMPARATIVE TESTS OF LIGHT SECURED AND OPERATING EXPENSE OF WELSBACH LIGHTS AND OIL LAMPS.

Welsbach.—The average of several tests of a No. 34 Welsbach light, with new No. 169 "J" mantle, gave 28.2 candles per foot of gas. The best results were secured at from 2.6 to 2.9 feet of gas per hour, 15-10ths pressure.

At 28.2 candles per foot, 3 feet would give 84.6 candle power per hour, at a cost of three-tenths cent, with gas at $1 per 1,000 feet.

A Good Oil Lamp.—The Royal burner, a good, round-wick, central-draft oil burner, consumed one gallon of the best kerosene oil in 25 hours. A series of photometric tests developed an average of 30-candle power, when the lamp was on the verge of smoking. The 25 hours of light cost 12 cents, or 48 100 cent per hour.

Best Oil Lamp.—The Bradley & Hubbard, said to be the best oil burner on the market, consumed one gallon best kerosene oil in 22 hours and 10 minutes, and developed, under the photometric test, 37½ candle power, when on the verge of smoking. The 22⅛ hours of light cost 12 cents, or 54-100 cent per hour.

Memoranda.—We used the best kerosene oil costing 12 cents per gallon. A poorer grade can be had for 10 cents per gallon.

Summary of Tests.—Good oil burner, 30-candle power 25 hours = 750 candle power hours; oil costs 12 cents.

Best oil burner, 37.5 candle power 22⅛ hours = 831-candle power hours; oil cost 12 cents.

No. 34 Welsbach light, 84.6 candle power 40 hours = 3,384-candle power hours; gas cost 12 cents.

Memoranda.—The cost of mantles at 50 cents, on an estimated average life of 500 hours each, is 1-10 cent per hour, which, added to cost of gas, 3-10 cent makes the total operating cost per hour 4-10 cent. On this basis the Welsbach gives 84.6-candle power 30 hours = 2,538-candle power hours at a cost of 12 cents.

Comparing cost of operating the Welsbach light with the mere cost of oil for the lamp, exclusive of other necessary charges, the Welsbach develops an efficiency over three times that of the best oil lamp, and shows a saving of over 30 per cent. in the actual cost for material mentioned per hour of use.

The next topic, "Experience in Service Pipe Stoppages and Mode of Prevention," brought up the subject, "Automatic Alcohol Injectors." One of these, connected up in working order, was exhibited by Mr. Douglas.

The third topic, "Acetylene," failed to bring out a single statement or question. The fourth topic was "Electric Lighting Attachments for Welsbach Lights," and in this Mr. F. G. Corbus, of the Welsbach Commercial Company, made a statement of general interest to the members. At 4:15 the Association went into executive session (for participation by active members only), with the further understanding that the meeting would reconvene in regular way the following morning.

SECOND DAY—THURSDAY, FEB. 18—MORNING SESSION.

The proceedings of the second day were begun by the reading of the following paper, by Mr. L. E. Walker, of Lansing, Mich., entitled

"SNAGS."

Mr. President and Members of the Association:

Regretting my inability to favor you with anything new or instructive in the production or distribution of gas, will endeavor to briefly touch on a few of the unpleasant features or "snags" that we are almost certain to run across, especially those of us who are our own "complaint clerks and "general utility men" in small or moderate sized plants.

"The best laid plans of mice and men gang aft aglee;" so often with us, when everything above and below ground appears to be running smoothly, and we begin to congratulate ourselves on having the "whole thing down pretty pat," we are rudely awakened from our bit of egotistical reverie by striking full head on one of those "snags." Perhaps it is that drip, which, after being dry through rain and shine for weeks and months, surprises and chagrins you some night by filling up and shutting off one or more good customers at the most inopportune time possible.

Of course, wherever there is an effect there is certainly a cause, and if after a rain of more or less severity a drip fills up, it does not need the traditional "fall of a brick wall" to inform you that a leaky joint or connection exists in the system of mains drained by that particular drip.

But often times these leaks are difficult to locate, and when "run down" to approximately the spot may present new difficulties to overcome.

We have lately had quite a lively experience in this line ourselves. Those of you who have recently visited the Capitol City, very likely noticed the rather expensive improvement in the way of brick pavement on the principal avenues. At the time this was laid, we took, as we supposed, every reasonable precaution against having to disturb same, by re-calking doubtful joints, laying services to heretofore unconnected buildings and vacant lots, etc.; but in spite of all this, during the first real cold snap of the season, didn't one of the drips located under the paving laid on a concrete bed (part of the brick is laid on concrete and part on a sand cushion) begin to fill up, shutting off a large and recently added customer, requiring pumping at first twice per day, then three, four, and finally, for two whole days and nights I employed a man to pump the blessed (?) thing every two hours. Well, to remedy matters, we took up a section of the paving, tapped a hole on the under side of the main on each side of the drip, locating from which direction the water was getting in, but as it would involve a large expense in midwinter to follow it up and repair the leak, and as the city was loth to permit any more of its new paving being disturbed we compromised the matter by building a regulation manhole over the spot where the drip had been and connected same with the city sewer. In place of the drip pot we substituted a gas pipe trap and can now retire at night, feeling assured that aforementioned customer will have light all night and every night.

Now, eccentric drips are only one of the many "snags."

Cold weather brings with it those aggravating and often almost unavoidable "freeze ups." Although we have made it a point to wrap our services where exposed in cold areas, taking care that the hair-felt wrapping extends through the outer wall, we still find it necessary in frigid weather to systematically visit a considerable number of them and "wet their whistles" with a little wood alcohol.

Then there are those minor mishaps at the works, the occasional stoppage here and there, so apt to occur during the busy season, when a delay of even a short time means a great deal. By means of a number of test pipes brought up to a convenient point where they may be readily tried with a pressure gauge, we have considerably lessened the difficulty of locating the trouble. We found it necessary last fall to clear out the pipes between the relief and main holders. This we succeeded in doing by by-passing the former, shutting the holder valves, and filling up the pipes in question through the holder drips with naphtha, allowing same to stand three or four days, then turning on a good head of stream into them from our boiler, after pumping out the naphtha.

Now, back to our position as complaint clerk. How lonely we would be without the man whose "family was away all of last month," but whose "gas bill was larger than the month before, when all the family was at home, and entertaining company besides." But the most difficult complainant to meet is the one who greets you with, "Now, you know I am not a chronic 'kicker,' and always expect to pay my just debts; but you know a man doesn't like to pay for what he doesn't get, and now you can see for yourself that something is wrong somewhere." Then follows the harrowing tale of "only burning one jet less than an hour each night," and ending with the statement that "while they would like to burn gas they never can stand such bills as these, and if the next month's bill is as high they will have to stop using it altogether." Of course we have to listen patiently to their tales of woe and conjure up some satisfactory excuse for the seeming attempt to rob the "dear people." The average gas man of to-day, with the sharp competition from electric lights, etc., must needs use a great deal of policy in dealing with irate customers, and when ten or fifteen years ago a company could insist on the bill as rendered being paid, one now has to listen with forbearance to the oft times groundless complaint, laugh at the ancient jokes at the expense of the industrious gas meter; perhaps "jolly up" our friend with a cigar, and, in fact, use all the tact and persuasiveness at our command to retain a good customer's name on our books.

We have hailed with delight the advent of the Welsbach light, and all will concede that, *judiciously handled*, they are proving of great assistance to gas companies. But there is a dark side with many aggravating "snags," even to them. I presume the agents of this lamp have been annoyed by lights in certain places, that after careful and proper adjustments are continually requiring new mantles or chimneys. The trouble may be from the slamming of a heavy door or a jar to the floor above the fixture. It is easy to say "put on an anti-vibrator," but these articles as made to-day certainly do not add greatly to the appearance of a fixture, besides being quite expensive. Or, again, the fault may rest with a careless clerk carrying a step-ladder or piece of merchandise on his shoulder, or from trying to clean the shades.

Our members representing the companies doing business in the large cities can of course advocate the employment of a man or men whose sole duties are to carefully attend to these lights, and while this is practicable for *them*, those of us who represent comparatively small plants, with extensions and improvements to be made from the net earnings, and whose stockholders expect a fair return on their investment, know that we cannot afford the extra expense of gaily painted wagons and other "catchy" devices for "pushing" Welsbachs. We are meeting with very fair success in introducing by-passes on these lights. One or two of these in a residence, with the easy manner they present for controlling the light, puts gas nearly on a par with electric light, as far as convenience is concerned.

The most exasperating "snag" in the way of gas stoves we have to contend with "down our way," is the *domestic* from the "*rural districts*" who is a stranger to modern improvements in general, and who finds it so much easier to leave the burners running, because she expects to use them again in "a few minutes," and who finds it very convenient to light up the entire range to "take the chill off" of the kitchen on cold days. We are careful to see that the prospective *user* of a gas stove is fully instructed in its workings and appraised of the fact that, if used with ordinary care, it will prove a great convenience and be economical as well, it can be made, by careless handling, a very expensive article. We have cards which are posted near the stove in which we caution the user to "turn off the burners where not actually in use," that "matches are cheaper than gas for kindling," "not to expect a gas range to economically heat the kitchen," etc.; but in spite of these precautions, those "verdant" hire girls will occasionally give "*Gas for Fuel*" a very "black eye."

So one could go on almost indefinitely, each branch of the gas industry having its own particular "snags." While modern inventions and improvements have rendered some of them less harmful and annoying than formerly *there are others* which will continue to vex the long suffering gas man as long as light, heat and power are among the necessities of man.

The discussion was useful and entertaining, and many reminiscences by members of "Snags" already passed, and suggestions of "Snags" that might be in store for the gas men of the country were referred to. A vote of thanks was passed to Mr. Walker, after which the fifth topic, "Coal-fired Benches," was taken up. The debate brought out much interesting matter, the retort men and the managers of some of the larger works represented contributing quite a fund of valuable information to the meeting. The sixth topic, "Why should not Gas Appliance Connections be Made Free and Charged to Construction Account, as Well as Service Pipes Run and Meter Connections Placed Free and Charged to Construction Account?"

This discussion was brisk and well-sustained, the debate referring to the policy in general of gas companies as to their customers, as to forms for bookkeeping, as to capitalization, etc. The

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS

was then read:

ANN ARBOR, MICH., February, 1897.

Members of the Michigan Gas Association—Gentlemen: Your Committee on President's Address have carefully perused that able document, and desire to congratulate the Association and the gas industry on the successful year which they have had and the brilliant prospect for the future as set forth therein. We recommend to the Executive Committee that the Constitution be so amended that there be an initiation fee of $2, and that the dues shall be increased to $2 per annum for active and associate members, and that the additional resources shall be used to print copies of the papers in pamphlet form, which shall be distributed to members of Association at the meetings where papers are to be read. Respectfully submitted,

H. W. DOUGLAS,
J. M. WARD,
L. E. WALKER,
} Committee.

ELECTION OF OFFICERS.

The Committee on Nomination of Officers presented the following names for the respective positions:

President—H. W. Douglas, Ann Arbor, Mich.
Vice-President—C. H. Raynor, Adrian, Mich.
Secretary and Treasurer—Henry H. Hyde, Saginaw, Mich.

The report was accepted, and the gentlemen named were declared the officers of the Association for the ensuing year. The Committee on Next Place of Meeting reported in favor of Port Huron, which selection was indorsed. The President then made the following announcement of the names of those selected to prepare papers for the next meeting, the subjects to be at the option of the authors; but, if requested, the Secretary would name subjects for the papers:

F. H. Hess, Ann Arbor; H. G. Beatley, Marquette; F. J. Howden, Muskegon; W. H. Morgans, Pontiac; Robt. Calhoun, Bay City; S. Milo Dole, Adrian; E. J. Ellis, Detroit. The meeting was then declared adjourned.

Recovering Cyanides from the Waste Products of Gas Works.

English Letters Patent were recently issued to Messrs. G. P. Lewis and F. S. Cripps, whose invention relates to means for recovering cyanides not only from the effluent of gas works ammonia stills, but it may also be applied to a liquor obtained in a manner to be hereafter described from spent oxide of iron, after doing duty as a purifying agent in the manufacture of coal gas.

Crude ammoniacal gas liquor, the patentees point out, consists of a variety of ammonium compounds, which are usually grouped into two classes—namely, those containing "free ammonia" and "fixed ammonia" respectively. The gas liquor is found to contain sulphocyanide and ferrocyanide of ammonia ("fixed" ammonium compounds), which are, in common with the remainder of this class, generally decomposed in distilling towers by the use of lime—the ammonia being set free, while the sulphocyanide and ferrocyanide combine with the lime to form sulphocyanide and ferrocyanide of calcium; or the use of an alkali, such as caustic soda, produces sulphocyanide and ferrocyanide of that alkali in solution in the effluent liquor, which is generally regarded as valueless.

The mode of carrying out this invention (there are no drawings attached to the specification) is as follows: The effluent liquor is caused to flow into a cooling tank, where it is mixed with a solution of sulphurous acid or ferrous sulphate, and, overflowing through an interposed strainer, in order to clear it of lime in suspension, it is received into another tank, where it meets with a small stream of a solution of a copper salt, which precipitates the sulphocyanide present as insoluble white cuprous sulphocyanide. The supernatant liquor may then be run off as waste, if not otherwise required. The solution of sulphurous acid, or sulphurous acid gases, for treating the effluent liquor, can be obtained by passing "waste gases" through a furnace or kiln, suitably constructed and arranged for converting the contained sulphureted hydrogen into sulphurous acid; the resulting products passing through a tower filled with bricks of coke, down which a stream of water trickles, absorbing the sulphurous acid and a portion of the other gases, and flowing thence into a cooling tank. Alternatively, the effluent liquor may be passed through a scrubber. If the liquor is not treated with a reducing agent, such as sulphurous acid, before adding the solution of a copper salt, black cupric sulphocyanide is precipitated, which is partly soluble; whereas white cuprous sulphocyanide is insoluble. The precipitate of cuprous sulphocyanide is allowed to lie in the settling tank until a sufficient accumulation has been obtained for further treatment. It is then washed, to remove impurities, and may be utilized for producing various sulphocyanides. Supposing ammonium sulphocyanide is required, it is exposed to the action of a liquid produced, as follows: The gases evolved in ammonia stills consist principally of ammonia, sulphureted hydrogen, carbonic acid and steam; and they are generally passed through a saturator, where the ammonia is almost entirely absorbed by an acid, such as sulphuric acid, as in the well known method of manufacturing sulphate of ammonia. The remainder, together with sulphureted hydrogen and carbonic acid, pass up the outlet pipe. These waste or foul gases are usually cooled by passing them through some form of condenser, which causes them to deposit a liquid which is sometimes almost in the condition of ammonium sulphydrate; but this state of things is not always attained. The liquid is therefore allowed to flow into a suitable form of gas washer; and a stream of ammonia gas is passed through it, until the liquid is as nearly as practical in the condition of ammonium sulphydrate.

Waste gases of similar composition to the above are also evolved in the partial distillation of ammoniacal liquor, as in the well known Hills' process of ammoniacal liquor purification, and may also be applied with the same object. Cuprous sulphocyanide is decomposed by ammonium sulphydrate into ammonium sulphocyanide in solution, and a precipitate of sulphide of copper. The ammonium sulphocyanide is separated by filtration, and may be obtained in the crystalline condition by evaporation.

Potassium of sodium sulphocyanide, and the like, may be produced as follows: Potassium or sodium hydrate, or carbonate, as the case may be, is run into the washer mentioned above; and a stream of the waste gases is passed into it, converting it principally into sulphydrate of the alkali employed. Potassium sulphydrate converts cuprous sulphocyanide into potassium sulphocyanide and sulphide of copper, as before. The solution of sulphurous acid for treating the effluent liquor may be obtained by passing the waste gases through a furnace, so constructed and arranged as to burn the sulphureted hydrogen principally to sulphurous acid; the products passing through a coke tower, down which a stream of water trickles, absorbing the sulphurous acid, and a portion of the other gases, and flowing into a cooling tank for effluent liquor, as already described.

The process may also be applied to a liquor obtained from spent oxide of iron. The oxide is first freed from sulphur by any known methods, and it is then soaked in water and boiled with lime, the resulting liquor being run into a cooling tank and treated as explained.

[No. V.]

Some Details of the Displays at the Recent Gas Exhibition, Madison Square Garden, New York, under the Auspices of the Gas Industries Company.

The manufacturers of fireclay goods were well represented at the Exhibition, and, strange to say, although their specialties are not calculated to attract the attention of the general public, it is nevertheless a fact that the non-professional visitors to the show made many inquiries at the "fireclay spaces" regarding the purposes for which the goods displayed were used.

Space No. 128 was taken up by Mr. Cyrus Borgner, of Philadelphia, who exhibited a comprehensive line of samples of the fireclay wares manufactured in his well-appointed shops. Retorts of different shapes and lengths were prominent in the display, as were models of the full and half-depth regenerator systems of bench firing advocated by Mr. Borgner, the remainder of the exhibit being mainly made up of examples of tiles, firebrick, blocks, etc., for coal and water gas plants.

Space No. 119 held the exhibit made by Messrs. J. H. Gautier & Co., of Jersey City, N. J., who preferred to show the smaller samples of their goods, rather than to go in for an elaborate display of the heavier things that they are well up to getting out for the trade. Here, too, some attempt at adornment was also made, for several potted palms showed gracefully amongst the "things of clay" that predominated. Clear models of the Flemming generator furnace, the patents for which are controlled by the Messrs. Gautier, were shown; also in evidence were two samples of the Company's retorts, specimens of tiles, firebrick, shapes, etc., and packages of the raw material entering into the composition of the Company's well known goods. The Company's clever and smiling Vice-President, Mr. David R. Daly, was in charge of the exhibit.

Perhaps the best arranged display in respect of fireclay goods was that made by the Parker-Russell Mining and Manufacturing Company, of St. Louis, Mo., which exhibit was planned, carried out and directed all through by the Company's dapper and alert Vice-President, Mr. Daniel R. Russell. The exhibit covered floor spaces Nos. 166 and 167, and it included: A retort, 19 in. by 31 in. by 9 ft. 6 ins., made especially for the Laclede Gas Company, of St. Louis, Mo., to fit its special benches of 4's, the furnaces of which are adapted to coal burning; also, one retort, 16 in. by 26 in. by 9 ft. 4½ ins., for settings of the Bredel type, coal fired furnace; special shaped tiles for the type of water gas apparatus installed by the United Gas Improvement Company; setting and recuperator tiles for benches, locomotive arch tiles and firebrick. A feature of the exhibit was a beautifully finished model of the Parker-Russell Company's latest improved semi-recuperative bench of 6's. It was in one sixth size, made to scale and so perfect in detail that it could be taken apart to show complete detail of furnace and flues. Another very interesting feature of the exhibit was a model showing four arches, one of which was fitted with a bench of 3's, clay retorts, while another was fitted with a bench of 5's, iron retorts, with the ordinary settings in vogue in 1850. This comparison was striking in the extreme, as showing the advances made in bench construction and finishing in the last 50 years. The model was loaned by that well-beloved old-time gas man, Mr. Charles R Faben, Sr., of Toledo, Ohio. Photographs were shown of the Parker-Russell Company's extensive manufacturing plants, and of the full-depth recuperative b nches of 9's, built by the Company some time ago for the Atlanta (Ga.) Gas Light Company. Other photographs showed a stack of like design, installed by the Toledo (Ohio) Gas Light and Coke Company last season.

Spaces Nos. 126 and 127 were taken up by the mammoth display of Mr. Adam Weber, proprietor of the Manhattan Firebrick and Enameled Clay Retort Works, of East 15th street, New York, and Weber, N. J. The exhibit as a whole was well illustrative of the goods turned out by the Manhattan Works—retorts, firebrick, tiles, shapes, blocks, and samples of the clays obtained on the Weber, N. J., site, being shown in profusion. On a handsomely draped easel was placed an excellent likeness of the proprietor of the Manhattan Works, and his kindly face beamed out a cordial welcome to the many who "looked in" at the Manhattan's stand. To the reminiscent came the thought, on scanning the Weber portrait, "There's a man who, if he would, could tell much of the history of the development of the gas business during his half century's active connection with it." Another feature of the display was a sequence series of large photographs showing the ins and outs of the village of Weber, Middlesex county, N. J. This town, which was formed about three years ago by Mr. Adam Weber, is a model one. The works are extensive and complete, and their location on the Raritan river, here navigable for deep draught vessels, with the additional fact that two surface and two trestle switches of the Lehigh Valley Railroad enter the yards, shows the facilities at command for the receiving of materials and the shipping of finished goods. The workingmen's houses, numbering 35 finished, each bearing the name of some prominent gas engineer, are lacking in nothing that goes to the welfare and comfort of the occupants. An ample water supply to each house is laid on, and the town boasts of a water and fire department. Another resource that aids the resident of Weber to a better appreciation of life is a well-appointed hotel, within the walls of which is a library with more than empty shelves. For the bodily diversion of its residents, a handsome billiard room and a well laid out bowling alley have also been equipped.

It is reported that a new corporation (to be known as the Jackson Gas Company, with a capital of $250,000), will take over the properties of the Jackson (Mich.) Gas and Fuel Company. Mr. W. M. Eaton will remain in charge.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

"INQUIRER" is informed that the candle power of the gas supplied by the Cleveland (Ohio) Gas Light Company is well above the ordinance requirements in that respect. The statute stipulates that the illuminating value shall not be less than 18 candles; and according to the reports of the city gas inspector, the average illuminating power for last January (mean of 9 tests for that month) was 18.99 candles—maximum, 19.7; minimum, 18.40. For February, during which month 7 tests were made, the average illuminating power was proved to be equal to 18.98 candles.

AT the annual meeting of the Clinton (Iowa) Gas Light and Coke Company, the officers chosen were: Directors, C. C. Coan, E. M. Highlands, L. Lamb, C. H. Young, A. Lamb, W. J. Young, Jr., and S. M. Highlands; President and Superintendent, S. W. Highlands; Vice-President, W. J. Young, Jr.; Secretary and Treasurer, A. Lamb. A notable thing in connection with this list is the promotion thereon shown of Mr. S. M. Highlands to the place of chief executive officer of the Company, a promotion to which his persistent and successful efforts on its behalf have justly entitled him. It is also worthy of remark that the entire capital of the Company is held by the Directors. The last year's business of the Company was the most profitable ever enjoyed by it, and the outlook is that this year will be even still more profitable in its results.

IT is said that a gas works is to be erected at Albany, Ga., Mr. W. A. Stokes seeming to be the moving spirit in the enterprise. This place is the capital of Dougherty County, Georgia, and is located on the Flint river at a point 107 miles south, south west of Macon. It is quite a point for the shipment of cotton, and has a population of 4,700.

THE proprietors of the San Diego (Cal.) Gas and Electric Light Company have arranged for the construction of a handsome new office building, to be located on the plot on Sixth street between D and E streets. The structure, which is to be of brick and stone, two stories in height, over a basement, is to have a frontage of 50 feet and a depth of 95 feet. The Company proposes to occupy the entire ground floor, and the estimated cost of the structure is $25,000.

AT the annual meeting of the Gettysburg (Pa.) Gas Company the following officers were chosen: Directors, J. W. Diehl, Jesse M. Walter, Geo. J. Benner, H. B. Nixon, L. M. Buehler, P. M. Bikle and John B. McPherson; President, J. W. Diehl.

THE following is the official statement made by the Boston (Mass) Gas Light Company, in the instance of the recent disastrous explosion, at the corner of Boylston street and Tremont street, on the morning of the 4th inst.: "Between 11 and 12 o'clock yesterday forenoon someone telephoned to the Boston Gas Light Company that there was a leak in the Masonic Temple. The receipt of this message was duly recorded and sent to the jobbing department. As soon as the first jobber came back (that is, at 11:40), this jobber, whose name is Green, was sent to ascertain what the complaint was; but, while Green was on his way to the Temple (that is, at 11:44), the explosion took place. Almost at the same moment that Green started for the Masonic Temple, a report was made to the street main department, in the basement of the Gas Company's building, by William Monagle, an employee of the Gas Company, whose duty it has been for months, under a special assignment, to patrol the gas mains on the lines of the subway, and to especially see, by actual operation, that the valves upon the street mains in the subway were in proper working order, and not covered by building material. Some of this street gang started with Monagle, so that they were going to the corner of Boylston street at the same time that Green was, but before anyone arrived there from the Gas Company the explosion took place. The explosion was heard at the Company's office on West street, and immediately all the officials of the Company, consisting of the President, Alfred C. Burrage; the Treasurer, F. P. Addicks; the Chief Engineer, W. R. Addicks, and the Engineer-in-Charge of the distribution, J. A. Gould, rushed to the scene of the explosion. Within two minutes of the time of the explosion the engineers and the street main force were at work shutting off the gas and doing everything that could be done. The engineers have made as thorough an examination of the situation as could be done under the circumstances, and find that at the exact junction of Boylston and Tremont streets, both the 6-inch main and the 8-inch main of the Boston Gas Light Company, running through Boylston street, were broken,

the 6-inch main being broken in at least two places, about 12 feet apart, and the 8-inch main once, at the exact intersection of the two streets, immediately under the central point of all of the intersecting street car tracks upon these two streets. Both of these mains contained gas and crossed over the top of the two subways running up Tremont street at this point. So far as this Company has any information those pipes have been in perfect condition, and even now all the joints of both of these pipes are in a perfectly sound condition. The breaks are evidently clean, sharp fractures in the main pipe, and in no case at the joints, thus showing that there was no defect in the pipe or joints. These breaks were sudden and sharp, and gas must have accumulated in this air space, and the explosion must have been caused by a spark from the street railway tracks or wire igniting the explosive mixture of gas and air coming up through the cracks between the planks. During the construction of the subway these pipes have been supported by those building the subway. At this particular point, although the subway itself was practically completed, the space between the top of the subway and the street surface was open except for timbers, iron beams and planks supporting the car tracks and planks in the street surface. This space has been left open for months, and was still open, in order that the final work, such as waterproofing, etc., which has to be done upon the top of the subway, could be finished. The Gas Company itself, however, has been doing no work here. It does not know how much work has been done within the past few days at this point by the subway people, or by other companies. It is evident to the engineers that these fractures of pipe were not caused by any operation of the Gas Company, and that whether caused by the weakness of the supports put in by those at work there, or by some extraordinary weight of cars and tracks, or general settling of the ground at this point, it could not have been prevented by any action of the Gas Company. The accident is one of the most serious that has ever happened in Boston, and no one can deplore it more than the officials of the Gas Company, who are doing all that they can, and only regret that there is nothing they can do for the unfortunate people who have been injured."

DR. LARRAT W. SMITH has been elected President of the Consumers Gas Company, of Toronto, Can., vice the late Mr. James Austin. Mr. Thomas Long was chosen to fill the existing vacancy on the Board of Directors.

THE Committee on Manufactures of the Massachusetts Legislature has negatived the petition of Mr. T. E. Wardner, who asked that the gas rate for Boston be put at 75 cents per 1,000.

PROF. GILL, of the Massachusetts Institute of Technology, has prepared a volume which deals with the topic of "Gas and Fuel Analysis for Engineers." It is well put together. Its main themes are the composition, derivation and analysis of solid, liquid and gaseous fuels.

THE La Capital Company, of Buenos Ayres, Argentine Republic, South America, has let a contract for the materials for a power station, and the necessary equipment for the power production, together with the road bed and cars, to builders resident in the United States. The Berlin Iron Bridge Company, of East Berlin, Conn., has secured the contract for furnishing the skeleton steel work of the building and the roofs. The roof over the engine and dynamo room is to be covered with corrugated iron lined with the Berlin Company's fireproof anti-condensation roof lining.

THE affairs of the old Saratoga (N. Y.) Gas and Electric Light Company having been straightened out, and the receivership of Mr. Lafayette B. Gleason having been terminated, the owners of the properties have completed the reorganization thereof. The new corporate name of the concern is the Saratoga Gas, Electric and Power Company, and its President is the Hon. Edgar T. Brackett. Mr. P. F. Roohan, formerly bookkeeper for the old Company, has been appointed Superintendent, vice Mr. Howard A. Brooke.

A CORRESPONDENT, writing under date of the 8th inst., presents the following interesting comment on the recent explosion at Tremont and Boylston streets, Boston, Mass.: "On Wednesday, March 3d, occurred one of the most disastrous gas explosions which Boston ever knew, in which 9 people were killed, nearly 100 more or less injured, and over $50,000 of property destroyed. The explosion occurred at the junction of Tremont and Boylston streets, one of the most crowded sections of Boston's crowded streets, in the midst of its shopping district, and surrounded by such buildings as the Masonic Temple, Hotel Pelham, the new Hotel Touraine, the old Public Library and other prominent buildings. Its cause was the gathering of illuminating gas in a pocket formed beneath the surface of the street during the construction of the subway, which became ignited by the electric current of the street railway, arcing from wheels to the rails. No ranker instance of poor engineering, if it can be called engineering, was ever perpetrated on a trusting public by engineers than was done in the construction of this death trap by the subway engineers and their contractors, over whom they had full authority. Had it been a poorly constructed foundation, a weak bridge, or an insecure dam, their reputation would have been forever gone; as it was, the fault is with the gas, which was but the servant of the designer. After excavating the street, practically from curb to curb, and flooring over with heavy plank supported by steel beams, an immense tunnel, with perpendicular sides and arched top, called the subway, was built of brickwork in the trench, leaving outside the subway a vast cavern (with little if any ventilation), roughly triangular in shape, and extending many feet lengthwise of the street, in which were water pipes, gas pipes and services, electric conduits and all the underground works of a great city, much if not all of which had been undermined, disturbed and left more or less properly supported. The cracks of the planks became filled with dirt, and we have left under the feet of the thronging public one of the most diabolically arranged plans for the destruction of human life possible to conceive. There could be but one result. Across the top of the planks passed constantly a train of electric cars, their wheels ever throwing out a succession of sparks, their heavy trucks constantly jarring and surging upon the beams. Heavy teams, fire engines, and all the street traffic of a large city were passing constantly, and but one thing was lacking —an extra heavy jar, a slip of a prop, a break of a gas main or service, and a few minutes' time to fill the cavity, and then happened what any engineer fit to undertake underground work should have foreseen, and which no one ever wants to see again. Who is to blame? The Company that furnished the spark that lit the gas; the Company that furnished the gas; or the Company that furnished the opportunity? There can be but one answer. Boston's engineering history had not been well read by these men. About 20 years ago, on Federal street, an underground cavity had been left, a few hundred feet long, 18 inches high, and 8 or 10 feet wide, by the engineers in constructing one sidewalk over another; when fate willed, circumstances filled it up with gas. It was lighted by some unknown means, and four people were killed and many wounded. Meanwhile, after duplicating the conditions for a few days, a gleam has come to the contractors, and they are busily engaged in filling with earth the cause of all the trouble, while the various investigating bodies of Boston are quibbling as to the length of time the Gas Company had after notification, not realizing that the chain of events, from the break to the blow up, might have been instantaneous. Truly, an engineer is known by his work.—P. L."

AT the annual meeting of the Nashville (Tenn.) Gas Light Company the following Directors were elected: W. H. Jackson, V. L. Kirkman, M. M. Gardner, John M. Gray, Sr., M. M. Brown, James Simmons and B. F. Wilson.

AT the annual meeting of the Charleston (S. C.) Gas Light Company the officers chosen were: J. C. Simmons, G. L. Buist, H. E. Young, J. S. Riggs, M. Israel, George W. Williams, H. H. De Leon, Wm. Hartz and Thos. Turner; President, Thos. Turner; Secretary and Treasurer, Montague Triest. It is reported that an Eastern syndicate is making an attempt to purchase the properties of this Company.

AT a meeting of the proprietors of the Peoples Light, Heat and Power Company, of Salina, Kas., it was decided to rebuild the plant, the new works to be adapted to the manufacture of coal gas. The plans call for the construction of a brick building, 56 feet by 60 feet, for the housing of the new apparatus, which will be up to date in the instance of coal gas production. It was also determined to install two new boilers (60 inch by 16 feet) in the power station of the Company's annex, and to otherwise improve the electric plant. The ironwork for this construction will be furnished by the Kerr Murray Manufacturing Company, of Fort Wayne, Ind., and the betterments indicated will require the expenditure of about $10,000. This resolution goes to show that Manager Tracey and his associates are satisfied over the outlook for the artificial lighting business of Salina.

THE City Council of Dover, N. J., at its last meeting received the report of the Committee on Lamps and Fire, which Committee had been considering the application of the Dover Light, Heat and Power Company, for a franchise to operate a gas works there. Briefly stated, the Committee reported in favor of granting the franchise, provided

Mr. Fritchman and his associates in the proposed gas company would pay into the city treasury the sum of $10,000, which sum was to be considered purchase money merely. It is admitted that a gas company would be of great benefit to the city, and to the inhabitants of Dover; but the Committee reported that, as the franchise was one of great value, the city should reap in advance a round money benefit for the bestowal of the privilege. The Dover Electric Light Company has long held secure, without competition, the artificial lighting field of Dover and its vicinity, and when it is said that the Superintendent of the Dover Electric Light Company is the Chairman of the Lamps and Fire Committee of the Dover City Council, the reason for the $10,000 clause in the report on the application for the gas franchise is not far to seek. A fair query in connection with this matter is, "How much did the Dover Electric Light Company pay for its franchise?"

THE shareholders of the Kansas City Gas Company and the Missouri Gas Company, of Kansas City, Mo., have formally voted to accept the ordinance permitting them to merge their business through the creation of a third Company. The final steps in the consolidation will be taken as speedily as possible.

THE matter of a possible decrease in the gas rate at Troy, N. Y., to $1.50 per 1,000 cubic feet, has been considered by a special committee of the Troy Company's Directors (Messrs. George P. Ide, A. E. Bonesteel and F. E. Draper), and it is probable that such a concession will be agreed upon, the same to go into effect April 1st.

THE Joliet (Ills.) Gas and Fuel Company, to operate an opposition gas works in Joliet, under the Moran franchise, has been formed. It is capitalized in $100,000, and its officers are: President and Treasurer, Peter English, Manistee, Mich.; Vice-President, Daniel Drake, Traverse City, Mich.; Secretary and General Counsel, P. C. Haley, Joliet.

THE *Gas World* says the gas engine freight boat, l'Idee, on the Seine river, France, keeps doing its work greatly to the satisfaction of all concerned. It has now been running since 1894. The consumption of gas has never exceeded 640 liters, or 22.6 cubic feet per horse power per hour. The quantity of gas carried is 19,071 cubic feet, in 40 cylinders, weighing together 4¼ cwts., and the cargo is 180 tons. There is an interesting letter from the owner in the *Journal d'Eclairage au Gaz*, 1897, pp. 53–54, in which he expresses his own satisfaction, and narrates how engineering experts have been to inspect his boat. He now gets his gas ready compressed at Havre, by the Gas Company there.

Mechanical Refrigeration.

In his third lecture on refrigerating machinery, delivered before the English Society of Arts on February 11th, Professor Ewing again took up the subject of absorption machines. The efficiency of this class might, he stated, be measured by the ratio between the refrigeration effected and the supply of heat necessary to complete a cycle of operations. Thus, in the case of an absorption machine using sulphuric acid to absorb water vapor, much more heat was required to evaporate the water from the acid in reconcentration than was taken up by the vapor as it escaped from the surface of the water in the refrigerator. In the large Windhausen machine already referred to it appeared that the heat required to reconcentrate the acid in practice was about six times as great as that subtracted in the refrigerator.

A more common type of absorption machine was that in which ammonia was used. This was first invented by F. Carré in 1860. As is well known, it consisted of two closed vessels connected by a suitable tube. One of these contained a strong solution of ammonia in water. By the application of heat this ammonia was evaporated and compressed into the other vessel, where it condensed to form a liquid, the latent heat set free in the process being absorbed by a flow of water. On removing the source of heat from the vessel first named, the ammonia re-evaporated and was absorbed again by the water. The latent heat absorbed by the gas in changing its state produced a powerful refrigerative effect, which could be employed for ice production. As originally designed, the action was intermittent, but by various modifications a continuously acting machine was produced which was still used commercially. The plan followed was to use four vessels—viz., a generator, a cooler, a refrigerator, and an absorber. In one form of machine constructed by Messrs. Pontifex & Wood for Meux's Brewery, the generator consisted of a strong cast iron vessel in which the ammoniacal solution was heated by a coil of steam pipe. The evaporated gas, heavily charged with water vapor, was then passed through a separator in which most of the water was extracted. From here it was led to the cooler, the upper coils of which were distinct from the others, and in the preliminary cooling there effected the rest of the water was precipitated and sent back to the generator, whilst the nearly anhydrous gas passed on through the rest of the coils of the cooler, in which it was reduced to the liquid state. It was then re-evaporated in the refrigerator, producing cold. From here the gas was passed to the absorber, in which it was again taken up by water, being finally pumped back through an interchanger to the generator.

The machine in question has been in use over 17 years, and was practically as efficient as ever. The efficiency was, however, lower than that of a good compression machine, since the heat ratio could never exceed $\frac{500}{850}$ as it required 850 units of heat to evaporate the gas from its solution in water, whilst only 500 were absorbed by its evaporation from the anhydrous state. In practise it was much less. Much better results could therefore be obtained with "compression" machines, which were the type most generally employed. Nevertheless in certain cases the ammonia absorption machines had advantages, in particular in those in which it was necessary to work at very different rates throughout the 24 hours. For this reason the plant erected at St. Louis for the house-to-house distribution of cold was of this type. In this the liquefied anhydrous ammonia was distributed over the town through a main. The refrigerators inside the houses consisted of a coil of piping connected at one end to this main and at the other to a return main leading back to the works. The liquefied ammonia was allowed to evaporate in these coils, absorbing heat and producing cold in the process. The temperature could be regulated by adjusting the supply of ammonia by means of a cock. Experiments by Professor Denton had shown a heat ratio of .26 for machines of this type.

The most important classes of machine from a commercial point of view were those of the compression type. In these a vapor, compressed to a liquid inside a cylinder, was passed through a cooler, and finally allowed to re-evaporate inside the refrigerator, from which it passed again to the compressing cylinder, thus completing the cycle.

Almost any liquid could be used in these machines. The Windhausen absorption machine, already referred to, had at times been worked without the sulphuric acid, when it became a simple compression machine, using water as the working fluid. Another machine using water was also devised by Southgate & Blythe. Water had, however, the great disadvantage of occupying a very much larger volume in the state of vapor than it did as a liquid. It was also liable to freeze, though this objection could be removed by substituting brine for ordinary water.

The volume of vapor required for a refrigeration of 1,000 units at 32° F., was about as follows for different working agents:

Water	3,200	cubic feet.
Ammonia	9	"
Sulphuric acid	22	"
Carbonic acid	2	"

On the other hand, in an ordinary compression machine a refrigerating agent was the better the less the ratio of its specific to its latent heat. This was least with water and greatest with carbonic acid gas. Hence it became necessary to strike a balance of advantages, and it would probably appear that under some circumstances ammonia might be the most suitable fluid for use, whilst in other conditions the best results might be obtained with other working agents.

Gas Engines in Flour Mills.

Engineering furnishes some facts forwarded by a correspondent regarding the working arrangements of the new flour mill lately started in Paris by the Société des Moulins Truffant. It is driven by two large single cylinder horizontal "Simplex" gas engines, each indicating some 250-horse power, with single flywheel. It works night and day, and receives cheap gas, made with special plant from French coal by the Lencauchez system. The gas engines have been constructed according to the system of MM. Delamare-Debouteville and Malandin, with electric ignition, and working at 100 revolutions. A third gas engine, of 30-horse power, drives a dynamo for lighting the mill. The consumption of small Anzin French coal in the gas generator is expected to be 1¼ lbs. per brake horse power per hour; but tests have not yet been made. The main shaft of the mill runs at 200 revolutions per minute and is driven by a strap, 2 feet wide, from each of the gas engine flywheels. The mill is to produce 100 tons of flour per 24 hours. The gas engines are easily set going by a self-starter, and were working well during the writer's visit.

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MONDAY, MARCH 15, 1897.

The Market for Gas Securities.

The quotations for city gas shares show that the advances of a fortnight ago have been fairly well maintained, although since time of last writing Consolidated sold as low (for odd lots) at 151, which figure was made in it last Wednesday. To day (Friday) the opening was 155 to 155½. There can be no doubt that much higher prices will be made for Consolidated shortly, and we have no hesitation whatever in saying that before July is reached the stock will command higher prices than any that have yet been made in it. Only one specter seems to be in chance of a view, and that ghost is in connection with the liability of one of the city Companies to construe too liberally for its benefit the agreement about refusing to supply consumers with gas who owe other Companies for gas supplied, and so on. However, that ghost is one easily laid. New York and East River is virtually at the 50 mark, and the friends of that specialty are predicting that 65 is nothing short of its value. Standard, common and preferred, are in good demand at better prices. In fact, all city shares are firmer, In our advertising columns hereafter will appear the business card of Messrs. Marquand & Parmly, prominent members of the New York Stock Exchange.

Brooklyn Union gas is 98 to 98½, and is cheap at that. In one instance the Brooklyn Company might do better, for there are many mutterings in the eastern half of Greater New York over the quality of the gas that is being supplied. Chicago gas is steady; so is Baltimore Consolidated. Bay State is dull and lower, without any good reason for the decline. The Welsbach Light Company has declared a dividend of 20 per cent. ($1 per share), payable the 25th inst.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

MARCH 15.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	156¼	157¼
Central	500,000	50	195	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	204	207
Bonds, 6's	1,000,000	1,000	105	.
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	230	235
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	85	
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	49¾	50¼
Preferred	2,000,000	100	83½	84
Bonds 1st 5's	3,500,000	1,000	106	107
" 1st Con. 5's	1,500,000	..	97¼	97⅝
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	80	85
Preferred	5,000,000	100	108½	109¼
Bonds, 1st Mortgage, 5's	1,500,000	1,000	110	115
Yonkers	299,650	50	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	98	98¼
" " Bonds (5's)	15 000,000	1,000	109	109½
Bay State	15,000,000	50	10⅝	11⅛
" Income Bonds	2,000,000	1,000	..	35
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	..	85
2d " " "	3,000,000	1,000	70	72
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co.	25,000,000	100	77⅜	77¼
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds	7,650,000	1,000	94	94¼
Columbus	1,000,000	..	68	70
1st Mortgage	1,085,000	..	..	96
Consumers, Jersey City	2,000,000	100	..	75
" Bonds	600,000	1,000	100	102
Cincinnati G. & C. Co.	8,500,000	100	103¼	205
Consumers, Toronto	1,800,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	1,000,000	100	61½	62
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,400,000	..	..	..
Detroit	4,000,000	..	22	..
" Con. Bonds	4,312,000	..	78	78½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	82	84
" Bonds	2,000,000	..	91	93
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	130	135
" Bonds, 6's	2,650,000	..	105	107
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	84	88
Bonds	1,000,000	1,000	92	94
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	24	24½
Preferred	2,500,000	100	75	80
Bonds	9,034,400	1,000	94⅞	95
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	98	98
Bonds, 6's	4,000,000	..	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	53½	54
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10.000,000	100	97¾	98¼
St. Paul Gas Light Co.	1,500,000	100	67½	70
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	500.000	25	..	..
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	59	61
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DIVIDEND NOTICE.

OFFICE OF WELSBACH LIGHT CO.,
DREXEL BUILDING, PHILA., Mar. 10, 1897.

The Directors have this day declared a dividend of twenty (20) per cent. ($1 per share), payable March 25th, 1897, to stockholders of record at the close of business March 15th. Checks will be mailed.

1125-2 EDWARD C. LEE, Treasurer.

Position Wanted

To Take Charge of Main Laying,

By a man experienced in that line, with engineering education. Draughtsman and compiler of records. Address

1136-1 "GASTIGHT," care this Journal.

Situation Wanted

As Superintendent of a Gas Works,

By a man of 31 years' practical experience in every department, including office work. Experienced also in the operation of electric light and water works. Would accept a place as Assistant in a large plant. Best of references. Address

1136-2t "M. N. B.," care this Journal.

Position Wanted,

As Engineer or Gas Maker,

By a young man who has had 13 years' experience with Water Gas. Is thoroughly acquainted with the manufacture and distribution of the same, and can furnish good references. Is not afraid to work. Address

H. D. JONES, No. 521 Montgomery Street,
1135-2t Pittston, Luzerne Co., Pa.

ENGAGEMENT DESIRED

As Supt. of Gas (Coal or Water) or Gas and Electric Light Works.

Best of references. Ten years' experience gas; fifteen years' combination. Address

HOWARD A. BROOKE,
1133-5 Saratoga Springs, N. Y.

Position Desired

As Superintendent of Gas Works or Gas and Electric Light Works,

By a man 34 years of age. Sixteen years' experience in the manufacture and distribution of Coal Gas as Supt., and four years in the Electric line. Thoroughly competent to take charge of any plant, separately or combined. A practical mechanic, and understands the erection of gas plants and everything pertaining to the business. Not afraid of work. Salary no object until ability is proven. Best of references.

1.02-tf Address "M. E. J.," care this Journal.

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Position to take full charge of works, or Superintendent of Manufacturing and Distribution. Seven years' experience in pushing the stove business. At present in charge of works sending out 16,000,000 cu. ft. annually. Twenty per cent. increase in business over year 1895, accomplished through sale of stoves and Welsbach lights. Thirty-seven years old; 21 years in all branches of the gas business. Coal gas works preferred. Reason for desiring change, better school system. Gas Companies and well-known Gas Engineers as references. Salary reasonable. Address

1134-tf "M. L. H.," care this Journal.

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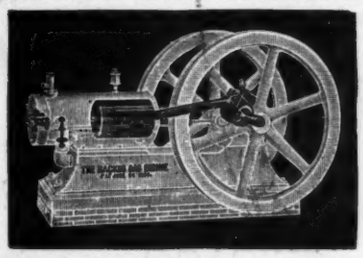

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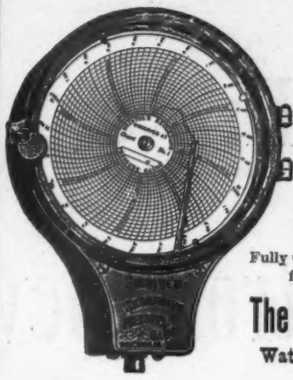

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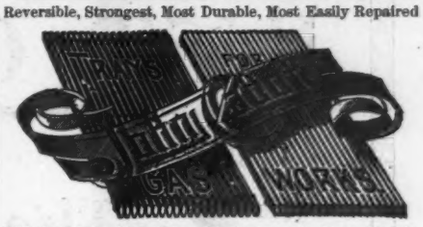

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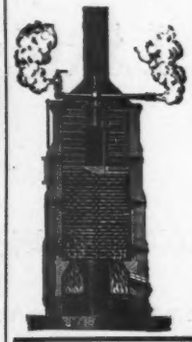

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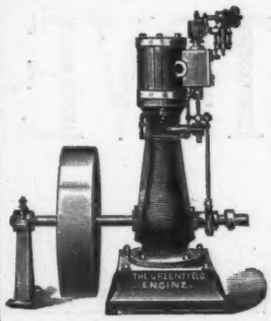

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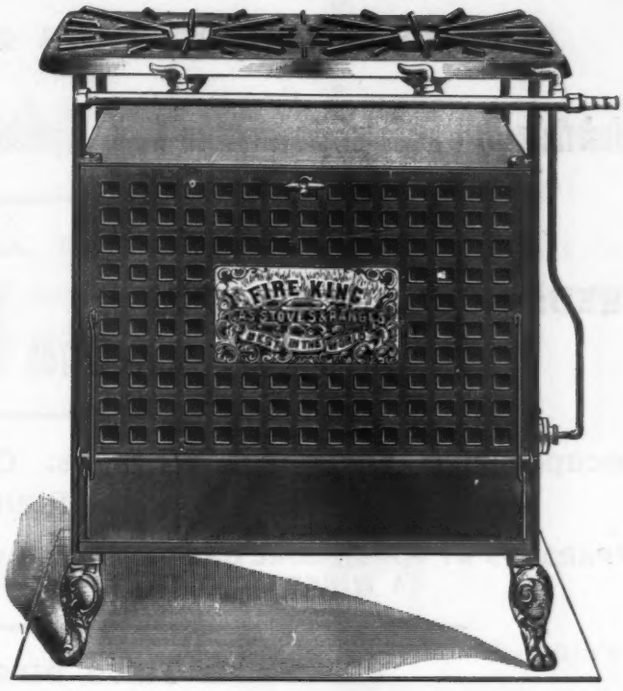

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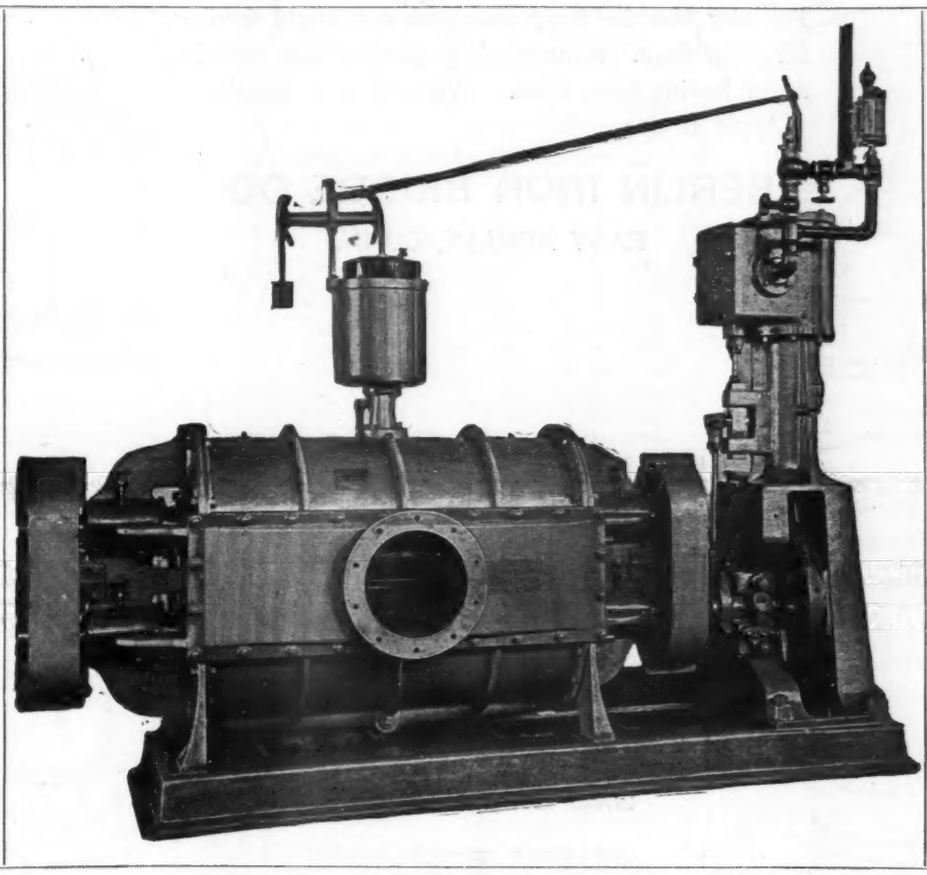

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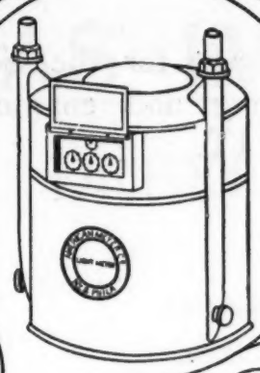
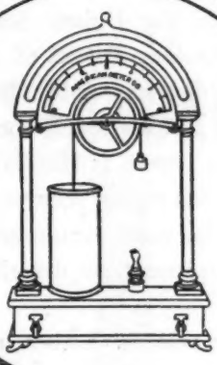
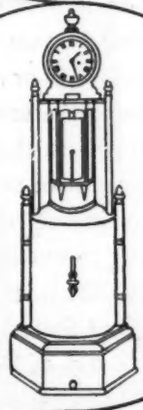
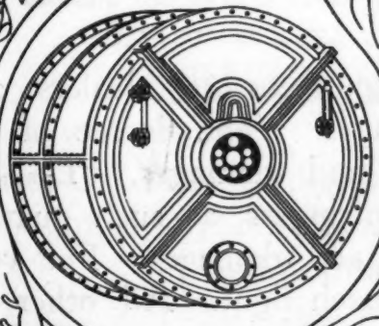








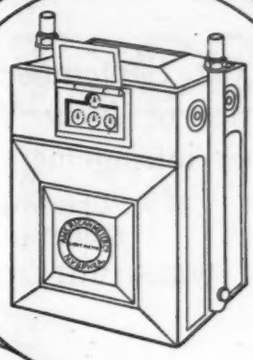
PUBLIC LIGHTING TABLE.

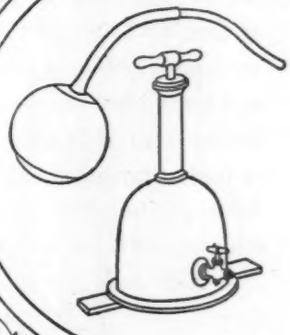
MARCH, 1897.

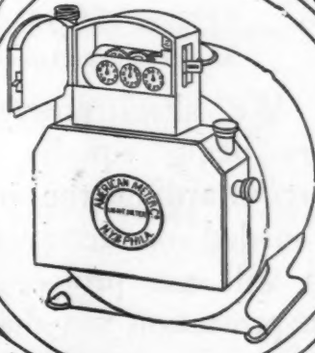
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Mon.	1	6.20 PM	5.30 AM	5.30	5.45
Tue.	2	6.20 NM	5.30	5.30	5.45
Wed.	3	6.20	5.30	5.30	5.45
Thu.	4	6.20	5.30	5.30	5.45
Fri.	5	6.20	5.30	5.40	5.35
Sat.	6	6.20	5.30	5.40	5.35
Sun.	7	9.30	5.20	5.40	5.35
Mon.	8	10.30	5.20	5.40	5.35
Tue.	9	11.30	5.20	5.40	5.35
Wed.	10	12.30 AM	5.20	5.40	5.35
Thu.	11	1.20 FQ	5.20	5.40	5.35
Fri.	12	2.00	5.20	5.50	5.20
Sat.	13	2.40	5.20	5.50	5.20
Sun.	14	3.20	5.10	5.50	5.20
Mon.	15	3.50	5.10	5.50	5.20
Tue.	16	4.20	5.10	5.50	5.20
Wed.	17	No L.	No L.	5.50	5.20
Thu.	18	No L. FM	No L.	5.50	5.20
Fri.	19	No L.	No L.	6.00	5.10
Sat.	20	6.40 PM	9.50 PM	6 00	5.10
Sun.	21	6.50	11.10	6.00	5.10
Mon.	22	6.50	12.30 AM	6.00	5.10
Tue.	23	6.50	1.40	6.00	5.10
Wed.	24	6.50 LQ	2.40	6.00	5.10
Thu.	25	6.50	3.30	6.00	5.10
Fri.	26	6.50	4.10	6.10	4.55
Sat.	27	6.50	4 40	6.10	4.55
Sun.	28	6.50	4.50	6.10	4.55
Mon.	29	6.50	4.50	6.10	4.55
Tue.	30	6.50	4.50	6.10	4.55
Wed.	31	6.50	4.50	6.10	4 55

TOTAL HOURS LIGHTING DURING 1897.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	233.00	January	423.20
February	187.20	February	355.25
March	202.00	March	355.35
April	170.40	April	298.50
May	163.00	May	264.50
June	140.40	June	234.25
July	151.40	July	243.45
August	167.30	August	280.25
September	174.40	September	321.15
October	200.00	October	374.30
November	205.20	November	401.40
December	220.10	December	433.45
Total, yr.	2216.00	Total, yr.	3987.45







INJUNCTION ISSUED AGAINST INFRINGERS.

On September 23d the United States Circuit Court for the Southern District of New York granted an injunction restraining and enjoining the further infringement of our Welsbach patent. READ IT.

UNITED STATES CIRCUIT COURT,
Southern District of New York.

WELSBACH LIGHT COMPANY,
vs.
A. LIEBES.
} IN EQUITY.

The President of the United States,

To A. LIEBES, and his servants, agents, attorneys and workmen, GREETING:

WHEREAS, It has been represented to us in our Circuit Court of the United States for the Second Circuit and Southern District of New York, that Letters Patent of the United States No. 438,125, were issued in due form of law on the 7th day of October, 1890, to Carl Auer von Welsbach, assignor of the complainant, then known as "Welsbach Incandescent Gas Light Company of New Jersey," and that the complainant herein is the owner of said Letters Patent, and that you, the said A. Liebes, have infringed the rights secured by the aforesaid Letters Patent, by making, using and selling to others to be used, incandescent devices for gas burners, embodying and containing the invention and improvements described and claimed in said Letters Patent No. 438,125.

NOW, THEREFORE, We do strictly command and enjoin you, the said A. Liebes, and your attorneys, agents, servants and workmen, under the penalties which may fall upon you in case of disobedience, that you forthwith and forever desist from directly or indirectly making, or causing to be made, delivering, vending, or causing to be sold, offering for sale, using, or causing to be used in any manner, any incandescent devices for gas burners, like, or similar to those which you have heretofore made, used or sold, containing or embodying the invention and improvements described in said Letters Patent No. 438,125, and claimed in the claim thereof, and from counterfeiting or imitating the said invention or improvements or any part or parts thereof, and from in any manner or way whatsoever, violating or infringing the said Letters Patent No. 438,125 and the claim thereof, and from doing, or causing to be done, any other act or thing whatsoever in infringement of the said Letters Patent No. 438,125.

WITNESS, The Honorable Melville W. Fuller, Chief Justice of the United States, at the City of New York, in the Southern District of New York, this twenty-fourth day of September, A. D., 1896.

(SEAL.) JOHN A. SHIELDS, Clerk.

(Endorsed) U. S. Circuit Court, Southern District of New York, in Equity.—Welsbach Light Company vs. A. Liebes. Injunction.

A Copy of a Writ of Injunction this day issued out of my office. JOHN A. SHIELDS, Clerk.

We shall proceed against all infringers; manufacturers, dealers and users being equally liable to injunction and damages. The decree of the court awarding the injunction also awards profits and damages. Do not be misled or deceived by guarantees offered by infringers, as such guarantees will not protect you against suit, injunction and damages. For your own protection see that you get the genuine Welsbach light. All other incandescent gas lights are infringements.

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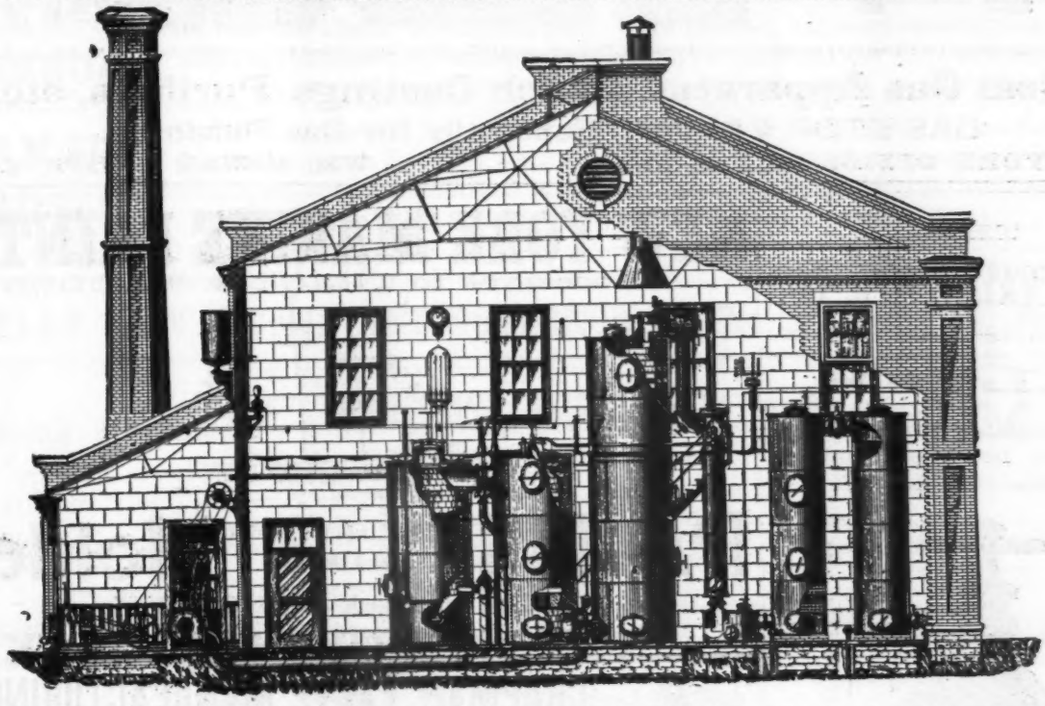

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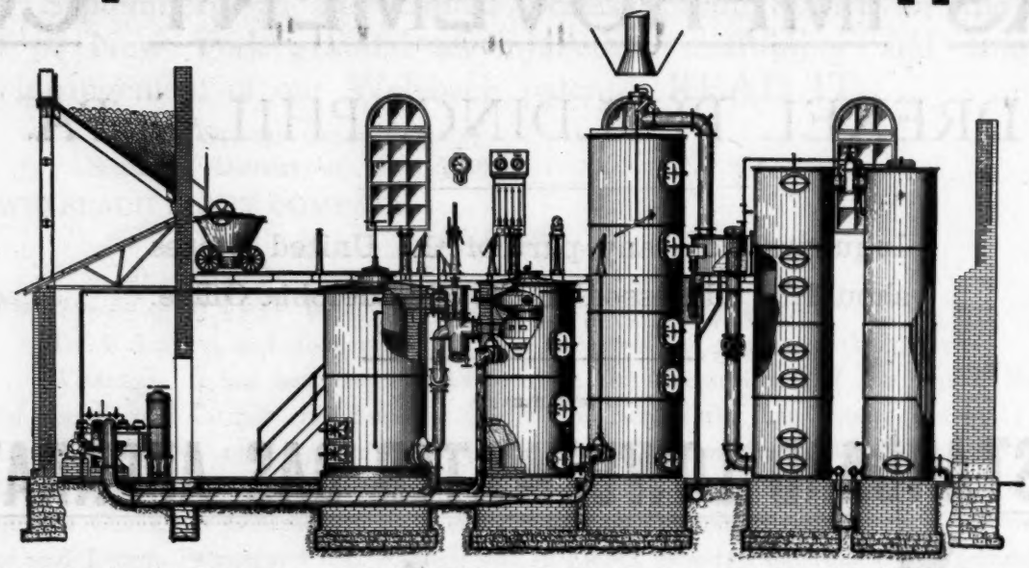

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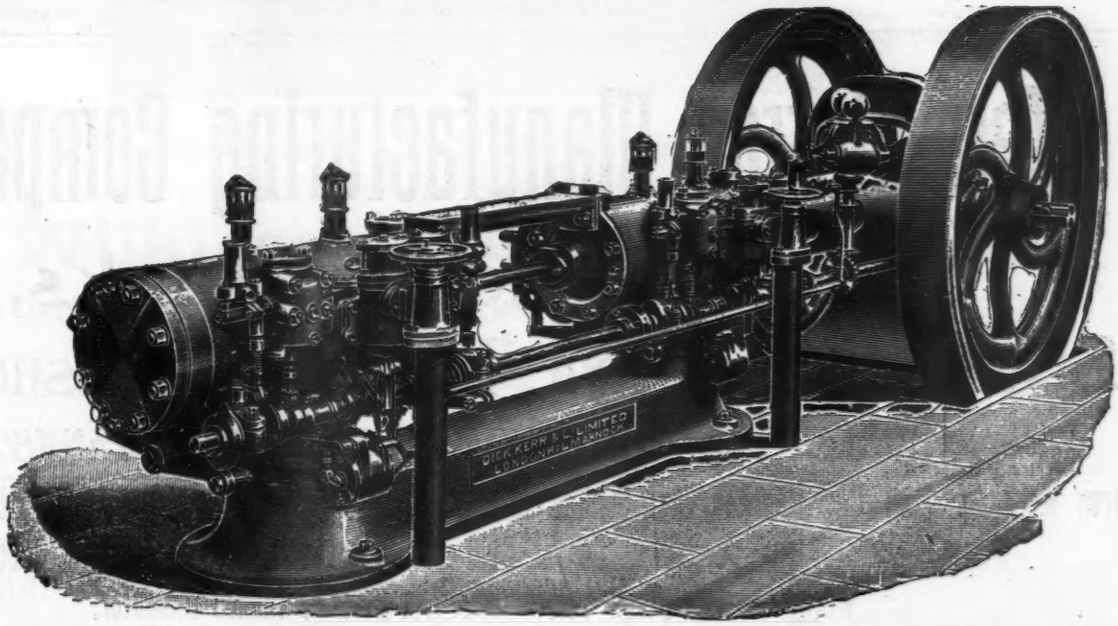

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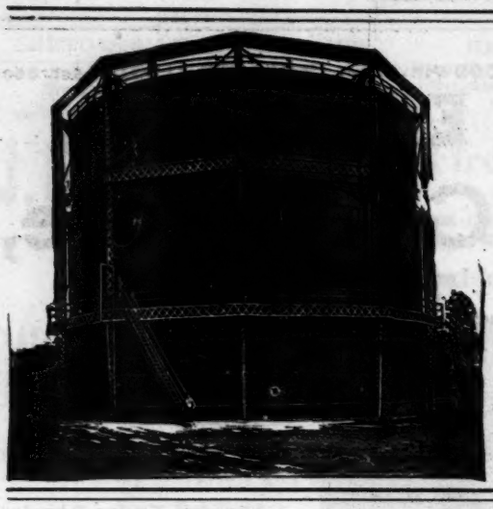

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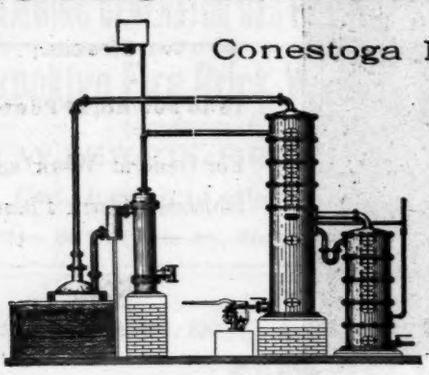

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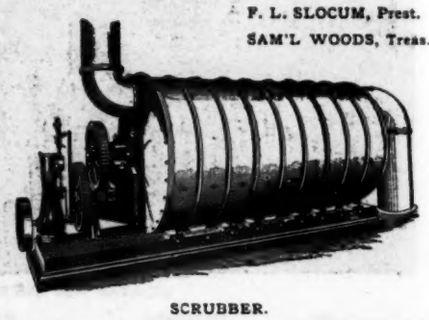

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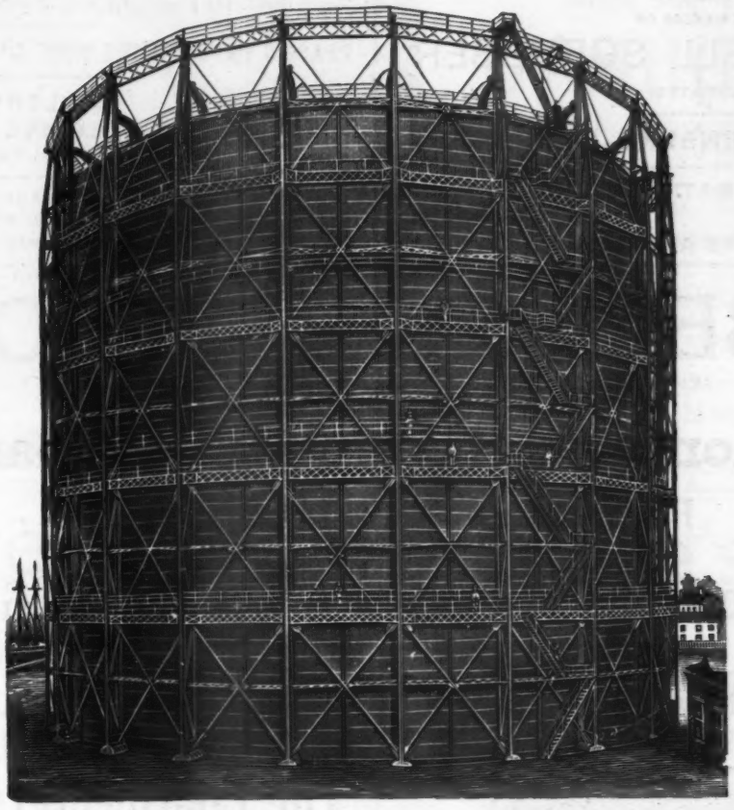

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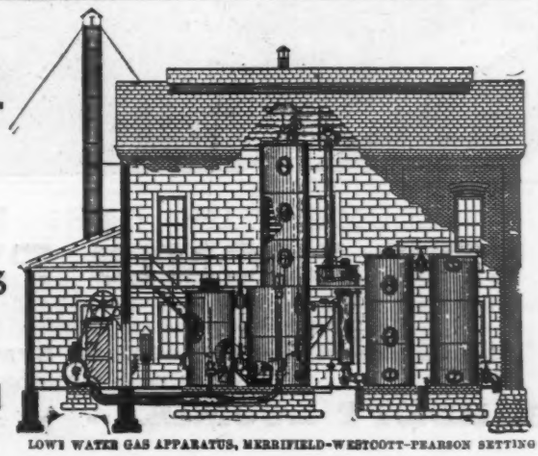

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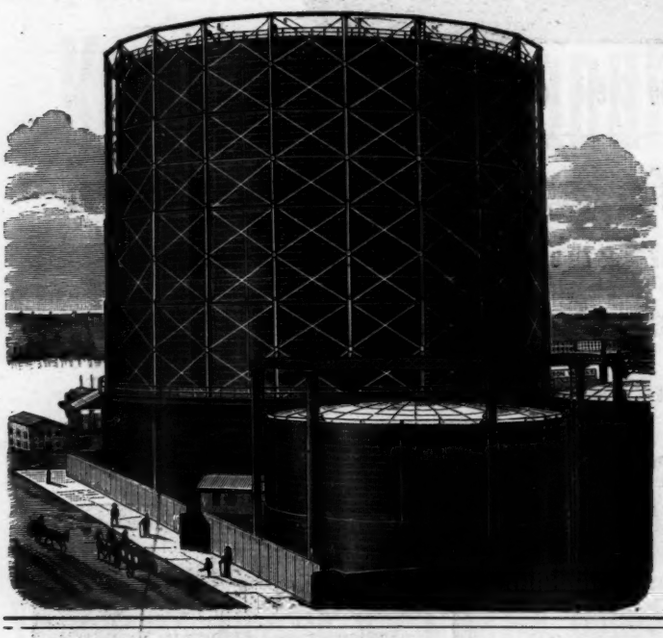

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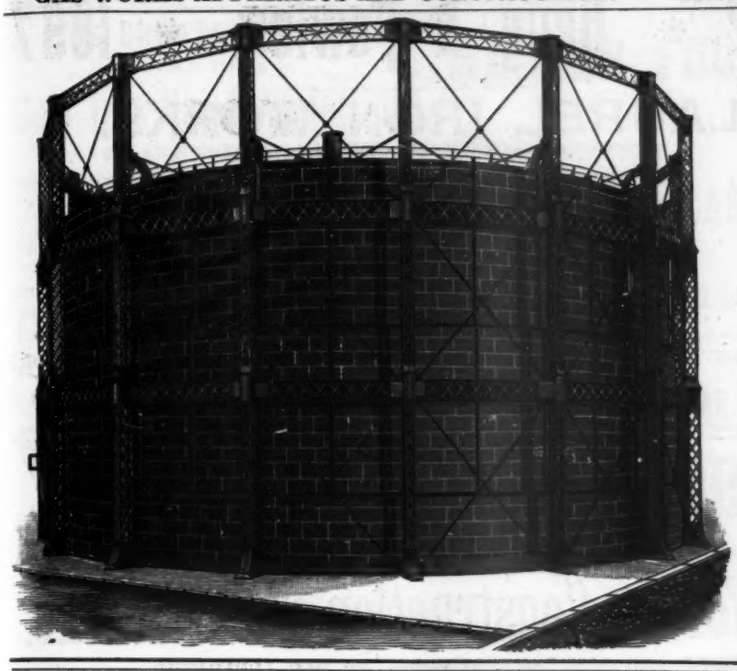

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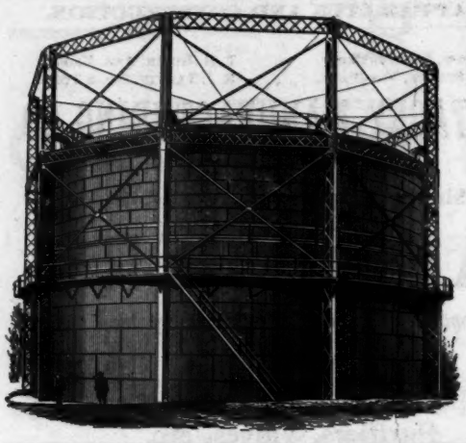

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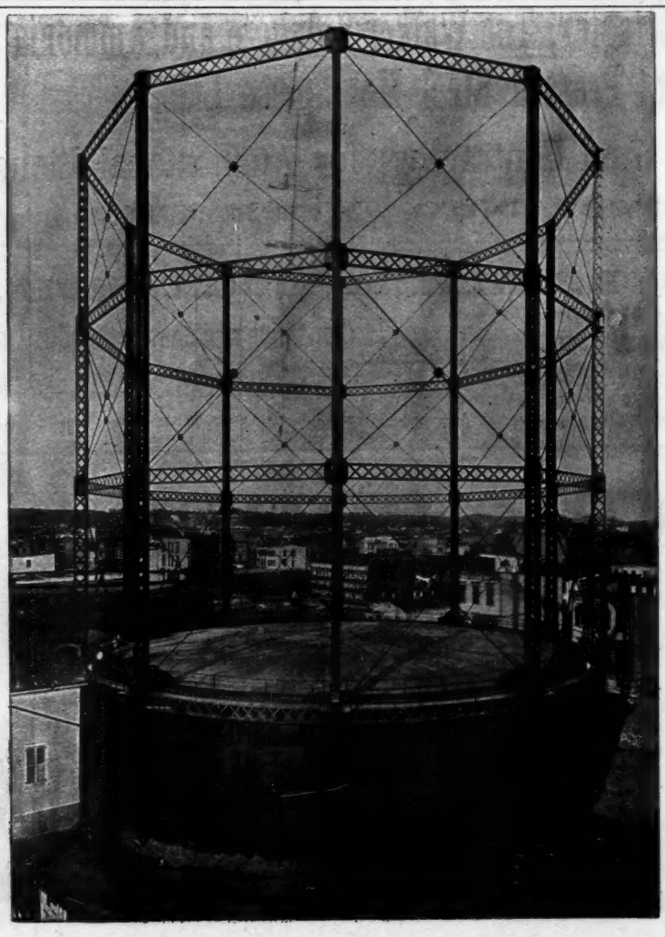

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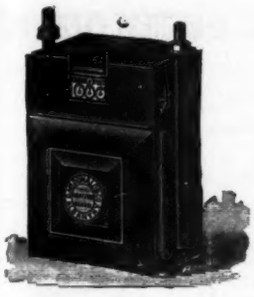

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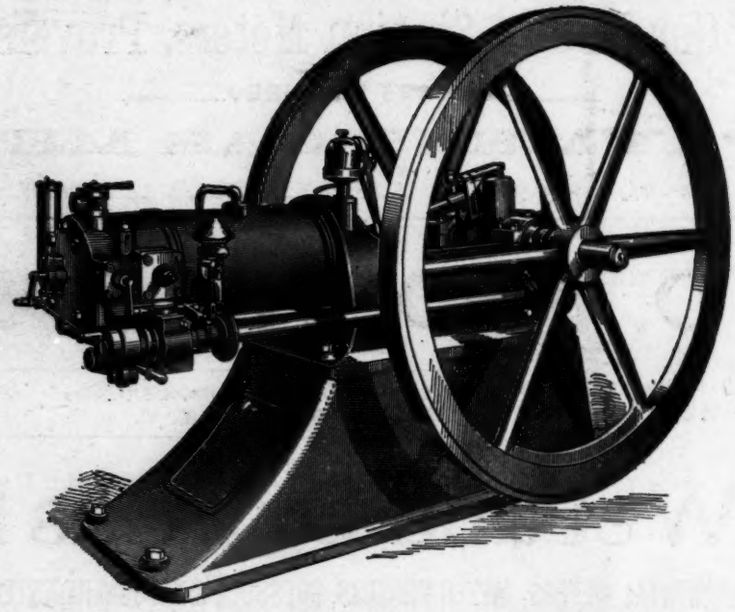

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